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**EMERGENCY RESPONSE PLAN**

**REVISION 2**

**DENISON MINES (USA) CORP.  
WHITE MESA MILL  
BLANDING, UTAH**

**APRIL 14, 1986**

**REVISED**

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## TABLE OF CONTENTS

	Page No.
<b>INTRODUCTION.....</b>	<b>1</b>
<b>MILL OVERVIEW.....</b>	<b>2</b>
<b>PLAN OBJECTIVES.....</b>	<b>2</b>
<b>1. FACILITY DESCRIPTION.....</b>	<b>3</b>
<b>1.1 Description of Licensed Activity.....</b>	<b>3</b>
<b>1.2 Description of Facility and Site.....</b>	<b>4</b>
1.2.1 Site Drawing.....	4
1.2.2 Communication and Assessment Centers.....	4
1.2.3 Assembly and Relocation Areas.....	4
1.2.4 Fire Water Supply and Alarm Systems.....	4
1.2.5 Office Building and Laboratory.....	5
1.2.6 Solvent Extraction Building.....	6
1.2.7 Mill Building.....	7
1.2.8 Maintenance Shop/Warehouse/Change Room Building.....	8
1.2.9 Reagent and Fuel Storage.....	9
1.2.10 Boiler Facilities.....	10
1.2.11 Sample Plant.....	10
1.2.12 Tailings Cells and Roberts Pond.....	11
1.2.13 Stack Heights, Diameters and Typical Flow Rates.....	11
1.2.14 Main Shut-Off Valves.....	11
<b>1.3 Description of Area Near the Site.....</b>	<b>11</b>
<b>2. TYPES OF ACCIDENTS.....</b>	<b>14</b>
<b>2.1 Description of Postulated Accidents.....</b>	<b>14</b>
2.1.1 Unloading, Storage of Ammonia.....	14
2.1.2 Ammonia Explosion in a Building.....	14
2.1.3 Unloading/Storage of Propane/Propane Fire or Explosion.....	15
2.1.4 Leach Tank Failure.....	16
2.1.5 Sulfuric Acid Storage Tank Failure.....	16
2.1.6 SX Fire.....	17
2.1.7 Other Fire.....	18
2.1.8 Tornado.....	18
2.1.9 Major Earthquake.....	19
2.1.10 Tailings Accidents.....	19
2.1.10.1 Flood Water Breaching of Retention System.....	19
2.1.10.2 Structural Failure of Tailings Dikes.....	20
2.1.10.3 Seismic Damage to Transport System.....	20
2.1.11 Terrorist/Bomb Threat.....	21

2.1.12	Chemical or Reagent Spills.....	21
2.1.13	Transportation Accident on the Mill Property Involving a Spill of Yellowcake.....	21
2.1.14	Offsite Transportation Accidents.....	22
2.1.14.1	Concentrate Shipments.....	22
2.1.14.2	Ore or Alternate Feed Material Shipments.....	23
2.1.14.3	Reagent Shipments.....	23
2.2	Detection of Accidents.....	24
<b>3.</b>	<b>CLASSIFICATION AND NOTIFICATION OF ACCIDENTS.....</b>	<b>25</b>
3.1	Classification System.....	25
a)	Alert.....	25
b)	Site Area Emergency.....	26
c)	On-Site Emergency.....	26
d)	Non-Subject Incidents.....	27
3.2	Notification and Coordination.....	27
3.2.1	Alert.....	27
3.2.2	Site Area Emergency.....	28
3.3	Information to be Communicated.....	29
<b>4.</b>	<b>RESPONSIBILITIES.....</b>	<b>30</b>
4.1	Normal Facility Organization.....	30
4.2	Onsite Emergency Response Organization.....	32
4.2.1	Direction and Coordination.....	32
4.2.2	Onsite Staff Emergency Assignments.....	33
a)	Facility System Operations.....	33
b)	Fire Control.....	33
c)	Personnel Evacuation and Accountability.....	34
d)	Search and Rescue Operations.....	34
e)	First Aid.....	34
f)	Communications.....	35
g)	Radiological Survey and Assessment (Onsite and Offsite).....	35
h)	Personnel Decontamination.....	35
i)	Facility Decontamination.....	35
j)	Facility Security and Access Control.....	36
k)	Request Support from Offsite Agencies.....	36
l)	Post-Event Assessment.....	36
m)	Recordkeeping.....	36
n)	Media Contact.....	36
4.3	Local Offsite Assistance to Facility.....	36
a)	First Aid and Initial Medical Services.....	36
b)	Ambulance and Paramedic Services.....	37
c)	Fire Department.....	37
d)	Law Enforcement.....	37
e)	Highway Patrol.....	37

f)	<i>Hospitals</i> .....	37
4.4	<b>Coordination with Participating Government Agencies</b> .....	38
5.	<b>EMERGENCY RESPONSE MEASURES</b> .....	39
5.1	<b>Activation of Emergency Response Organization</b> .....	39
5.2	<b>Assessment Actions</b> .....	39
5.3	<b>Mitigating Actions</b> .....	40
5.4	<b>Protective Actions</b> .....	40
5.4.1	Onsite Protective Actions.....	40
5.4.1.1	<i>Personnel Evacuation and Accountability</i> .....	40
5.4.1.2	<i>Use of Protective Equipment and Supplies</i> .....	41
a)	<i>Fire Hose</i> .....	41
b)	<i>Self Contained Breathing Apparatus</i> .....	41
c)	<i>Spill Clean-up Equipment</i> .....	41
d)	<i>Fire Fighting PPE</i> .....	42
e)	<i>Maintenance of Emergency Equipment</i> .....	42
5.4.1.3	<i>Contamination Control Measures</i> .....	42
5.4.2	Offsite Protective Actions.....	42
5.5	<b>Exposure Control in Radiological Emergencies</b> .....	42
5.5.1	Emergency Radiation Exposure Control Program.....	42
5.5.1.1	Radiation Protection Program.....	42
5.5.1.2	Exposure Guidelines.....	43
5.5.1.3	Monitoring.....	43
5.5.1.4	Decontamination of Personnel.....	44
5.6	<b>Medical Transportation</b> .....	44
5.7	<b>Medical Treatment</b> .....	45
6.	<b>EMERGENCY RESPONSE EQUIPMENT AND FACILITIES</b> .....	46
6.1	<b>Command Center</b> .....	46
6.2	<b>Communications Equipment</b> .....	46
6.2.1	Onsite Communications.....	46
6.2.2	Offsite Communications.....	47
6.3	<b>Onsite Medical Facilities</b> .....	47
6.4	<b>Emergency Monitoring Equipment</b> .....	47
7.	<b>MAINTAINING EMERGENCY PREPAREDNESS CAPABILITY</b> .....	49
7.1	<b>Written Emergency Plan Procedures</b> .....	49
7.2	<b>Training</b> .....	49
7.3	<b>Drills and Exercises</b> .....	49
7.3.1	Biennial Exercises.....	50
7.3.2	Quarterly Communications Checks.....	50
7.4	<b>Critiques</b> .....	50
7.5	<b>Independent Audit</b> .....	50
7.6	<b>Maintenance and Inventory of Emergency Equipment, Instrumentation and Supplies</b> .....	51

7.7 Letters of Agreement..... 51

8. RECORDS AND REPORTS..... 52

8.1 Records of Incidents..... 52

8.2 Records of Preparedness Assurance..... 52

9. RECOVERY AND PLANT RESTORATION..... 53

10. COMPLIANCE WITH COMMUNITY RIGHT-TO-KNOW ACT AND  
CLEAN AIR ACT..... 54

10.1 Community Right to Know Act..... 54

10.2 Clean Air Act..... 54

## EXHIBITS

Exhibit No.	Exhibit Name
1.....	Notifications
2.....	Internal Notifications
3.....	Site Layout Map
4.....	General Area Map
5.....	Drainage Map
6.....	Population Centers Map
7.....	Main Shut-Off Valves

## APPENDICES

Appendix No.	Appendix Name
A.....	Emergency Response Procedure for a Release of Anhydrous Ammonia
B.....	Emergency Response Procedure for an Ammonia Explosion in a Building
C.....	Emergency Response Procedure for an Uncontrolled Release of Propane
D.....	Emergency Response Procedure for a Leach Tank Failure of Sulfuric Acid Tank Failure
E.....	Emergency Response Procedure for a Fire in the Solvent Extraction Building
F.....	Emergency Response Procedure for a Fire
G.....	Emergency Response Procedure for a Tornado or Major Earthquake
H.....	Emergency Response Procedure for Tailings Accidents
I.....	Emergency Response Procedure for a Terrorist/Bomb Threat
J.....	Emergency Evacuation and Shut Down Procedure
K.....	Risk Management Plan Under Clean Air Act
L.....	Spill Prevention, Control, and Countermeasures Plan for Chemicals and Petroleum Products
M.....	Transportation Accidents Plan

## FIGURES

Figure No.	Figure Name
1.....	Fire System Schematic Drawing

## INTRODUCTION

The purpose of this Emergency Response Plan (this "Plan") is to reduce the risk to our employees and to the community from potential health, safety and environmental emergencies that could arise at the Denison Mines (USA) Corp. ("DUSA") White Mesa Uranium Mill (the "Mill").

This plan includes the following:

- evaluation of the potential risks for accidents, including fire, explosions, gas releases, chemical spills and floods (including tailings dam failure), that could occur at the Mill;
- specific emergency programs for each potential event;
- administrative response actions; and,
- emergency response contacts - both internal and external.

The Mill operates under the jurisdiction of the following regulatory agencies:

- Utah State Department of Environmental Quality, Division of Radiation Control;
- Mine Safety and Health Administration;
- Environmental Protection Agency;
- Utah State Department of Environmental Quality, Division of Air Quality; and,
- Utah State Division of Natural Resources Bureau of Dam Safety.

This Plan follows the standard format and content for emergency plans for fuel cycle and materials facilities set out in U.S. Nuclear Regulatory Commission ("NRC") Regulatory Guide 3.67 (January 1992) ("Reg. Guide 3.67"), to the extent applicable to the Mill. Section 3 of Reg. Guide 3.67 states that "in its emergency response plan and in coordination meetings with offsite authorities, the licensee should convey the concept that fuel cycle and materials facilities do not present the same degree of hazard (by orders of magnitude) as are presented by nuclear power plants. Thus the classification scheme for these facilities is different." Reg. Guide 3.67 also refers to NRC's NUREG-1140, "A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees", S.A. McGuire, January 1988, for a description of past incidents involving radioactive materials.

NUREG-1140 analyzed potential accidents for 15 types of fuel cycle and other radioactive material licensees, including uranium mills, for their potential for offsite releases of radioactive materials. NUREG-1140 concludes that for most of these licensees, for example uranium mills, the degree of hazard is small and that "the low potential offsite doses. . . the small areas where actions would be warranted, the small number of people involved, and the fact that the local police and fire departments would be doing essentially the same things they normally do, are all factors that tend to make a simple plan adequate." NUREG-1140 concludes that "an appropriate plan would (1) identify accidents for which protective actions should be taken by people offsite. (2) list the licensee's responsibilities for each type of accident, including notification of local authorities (fire and police generally), and (3) give sample messages for local authorities

including protective action recommendations. This approach more closely follows the approach used for research reactors than for power reactors.”

As a result, this Plan incorporates the most appropriate responses for the Mill, in accordance with the requirements of Reg. Guide 3.67 and the conclusions set out in NUREG-1140.

## **MILL OVERVIEW**

Master files containing Material Safety Data Sheets (“MSDSs”) for all materials in use at the Mill are maintained at the Safety Office, Mill Maintenance Office, Mill Laboratory and Mill Central Control Room. Copies are also on file at the Blanding Clinic, Doctor's Offices, Blanding Fire House and Office of the San Juan County Emergency Medical Coordinator.

## **PLAN OBJECTIVES**

The primary objectives of this plan are:

- To save lives, prevent injuries, prevent panic, and minimize property/environmental damage to the lowest possible level;
- To evacuate and account for all people in the area including visitors, truck drivers, contractors, etc.;
- To provide assembly areas that are as safe as possible and which can be reached without traveling through a hazardous area. Assembly areas will be properly manned to deal with sick or injured persons, and provisions will be made to evacuate those persons to proper shelter; and
- To make adequately trained personnel available to cope with rescue and recovery operations as directed by the Incident Commander.

## 1. FACILITY DESCRIPTION

### 1.1 Description of Licensed Activity

The Mill is located approximately 6 miles south of Blanding, Utah. The Mill processes conventional uranium or uranium/vanadium ores to recover uranium and vanadium. In addition to the processing of conventional ores, the Mill also processes alternate feed materials using similar process steps and chemicals. The conventional ore is stored on the Ore Pad (shown on the Site Layout Map included as Exhibit 3). Alternate feed materials are also stored on the Ore Pad and may be stored in bulk form, lined burrito bags, liners or drums. In certain circumstances, containerized alternate feed materials may be stored in locations off of the ore pad.

All of the ores and feeds processed at the Mill contain natural uranium and its daughter products. Uranium is in equilibrium with its daughters for conventional ores and is generally in various degrees of disequilibrium with its daughters for alternate feed materials, depending on the specific feed material. The descriptions of each alternate feed material are maintained by the Mill's Radiation Safety Officer. However, the Mill does not receive, process or produce enriched uranium of any sort, therefore there is no risk of a criticality accident at the Mill. The products produced at the Mill include ammonium metavanadate (AMV), vanadium pregnant liquor (VPL), vanadium pentoxide ( $V_2O_5$ ), and yellowcake, or uranium concentrate ( $U_3O_8$ ). The  $V_2O_5$  and  $U_3O_8$  products are packaged in steel drums for shipment. The AMV is packaged in either steel drums or super-saks while the VPL is sold in liquid form in bulk.

Drums containing  $U_3O_8$  and vanadium product are stored from time to time in a fenced, locked, paved area in the Mill's restricted area, pending shipment offsite.

The Mill utilizes a semi-autogenous grind circuit (SAG mill) followed by a hot sulfuric acid leach and a solvent extraction process to extract uranium and vanadium from ores, using large amounts of sulfuric acid, sodium chlorate, kerosene, amines, ammonia and caustic soda in the process. The reagent storage tank locations are described in further detail in Section 1.2.9 below. At any one time, there may be 1.4 million gallons of sulfuric acid, 63,000 gallons of anhydrous ammonia, 220,000 gallons of kerosene, 20,000 gallons of caustic soda and 30,000 gallons of propane and various quantities of other reagents stored or located on site. See Section 1.2 below for a more detailed discussion of the chemicals and reagents used and stored at the site.

Tailings and wastes generated from processing conventional ores and alternate feed materials are disposed of permanently in the Mill's lined tailings impoundments. The Mill's tailings cells are comprised of four below grade engineered cells, Cell 1, 2, 3 and 4A. Liquids are stored in Cell 1, Cell 3 and Cell 4A the active tailings cell. The liquid in the tailings cells is very acidic. In addition to the tailings cells, there is also an emergency lined catchment basin ("Roberts Pond") west of the Mill building. Solutions in this basin or the tailings cells should not be used to fight fires in the Mill facility.

## **1.2 Description of Facility and Site**

### **1.2.1 Site Drawing**

The Mill facilities are shown on the Site Layout Map included as Exhibit 3 and on the General Area Map included as Exhibit 4. See also Exhibit 7 for a listing and the locations of the main shut-off valves.

### **1.2.2 Communication and Assessment Centers**

The Mill does not have a specific communication or assessment center. Key personnel are equipped with handheld VHF transceivers, which will serve as the primary means of communication while personnel are assembling to the designated relocation areas and as needed thereafter to deal with the emergency. The relocation area will serve as the initial assessment center. Other communications and assessment centers will be set up in the Mill's Office building, Scalehouse, Warehouse or other areas of the Mill that have communication capability, as needed depending on the nature and location of the emergency.

### **1.2.3 Assembly and Relocation Areas**

When the evacuation alarm sounds or when personnel are verbally notified by radio or other means, all personnel will assemble at:

- The parking lot south of the office;
- The Scalehouse;
- North side of Tailings Cell 1; or
- North of the Mill.

The assembly site will depend upon conditions, i.e. nature of the emergency, wind conditions, etc. The Radiation Safety Officer ("RSO")/Fire Chief or Shift Foreman will specify the appropriate assembly site.

### **1.2.4 Fire Water Supply and Alarm Systems**

#### *a) Fire Water Supply*

The fire water supply facilities include:

- 400,000 gallon Storage Tank of which 250,000 gallons are reserved for fire emergencies; and
- Centrifugal diesel driven pump rated at 2,000 gpm at 100 psi. This pump starts automatically when the pressure in the fire main drops below 100 psi (See Figure 1, Fire System Schematic).

When more water is needed for an emergency an additional source is the Recapture Reservoir supply pipeline, which can be utilized in emergencies at a rate of about 1,200 gpm.

*b) Alarm System*

The alarm systems include the following:

- public address system;
- hand held radios; and
- siren.

### **1.2.5 Office Building and Laboratory**

*a) Office Building*

The office building (approximately 10,000 square feet) contains the administration offices, radiation health and safety offices and the Mill laboratory. The central file vault and the main computer system are also in this building. The ambulance is kept on the west side of the office building near the safety office entrance.

*b) Laboratory*

The laboratory facilities contain the following:

- three flammable cabinets (keys required);
- chemical storage room south of main lab;
- seven fume hoods - hoods 1,2, 3 and 4 are in the chemical laboratory and hoods 5, 6 and 7 are in the metallurgical laboratory. Only hoods 1 and 2 may be used for perchloric acid;
- outside laboratory chemical storage north of office building (key required);
- perchloric acid storage vault located underground west of office building (key required); and
- compressed gas cylinders are stored on the north side of the office building.

A wide variety of chemicals in small quantities are located in the Mill laboratory. These chemicals range from acids to bases along with flammable metal compounds and peroxide forming compounds. Oxidizers and organic chemicals are stored in a storage room in the laboratory, which have a strong potential of producing harmful vapors if the containers are damaged to the point that the chemicals are exposed. There are no acids stored in this storage room. The acids (including but not limited to sulfuric, nitric, acetic, perchloric, phosphoric and hydrochloric acids) are stored in the main laboratory area in 2.5 liter or 500-ml bottles. MSDS books for all chemicals in the laboratory are located in the Laboratory, Safety Department, Mill Maintenance office and Mill Central Control room.

c) *Electrical*

Electrical transformers and electrical switches are located in the laboratory at the east end of the chemical storage room.

d) *Fire Protection System*

The fire protection systems in the office building and laboratory include:

- a fire hose station located on the east end of the office building. The station includes two sets of turnout gear, two SCBA units and Incident Commander materials;
- automatic "wet" sprinkler system which is actuated at 212° F; and
- portable dry chemical extinguishers strategically located throughout the building.

### **1.2.6 Solvent Extraction Building**

The solvent extraction (SX) building (approximately 21,000 square feet) houses the uranium and vanadium solvent extraction circuits and the ELUEX circuit. The SX circuits may contain up to 200,000 gallons of kerosene (757,000 liters ) which has a flash point of 185° F.

Chemicals which may be encountered in the SX building include:

- Kerosene;
- Caustic Soda;
- Anhydrous Ammonia;
- Sulfuric Acid;
- Salt (Brine);
- Soda Ash;
- Ammonium Sulfate;
- Amines;
- Alcohol;
- Sodium Chlorate;
- Sodium Vanadate; and

Some VPL product is stored in the SX building.

a) *Electrical*

All electrical switches are located outside in the Mill Central Control room north of the SX building. The main control panel for all of the equipment is located in the Central Control Room in the main Mill building.

b) *Fire Protection System*

The SX building fire protection systems include:

- a “wet” AFFF foam sprinkler system with heat actuated sprinkler heads that release at 212°F; and
- portable dry chemical extinguishers strategically located throughout the building.

For fire hydrant and hose cabinet locations in the SX building refer to the Fire System Schematic included as Figure 1 in this Plan.

### 1.2.7 Mill Building

The mill building (approximately 22,000 square feet) contains process equipment related to grind, leach, counter current decantation, precipitation, and drying and packaging of uranium and vanadium products.

Chemicals which may be encountered in the mill building include;

- Caustic Soda;
- Anhydrous Ammonia;
- Sulfuric Acid;
- Soda Ash;
- Ammonium Sulfate;
- Sodium Chlorate;
- Sodium Vanadate; and
- Propane.

The finished products which are contained in the mill building include AMV,  $V_2O_5$  and  $U_3O_8$  (or yellowcake).

#### a) *Electrical*

The main electrical switch gear is located west of the SAG mill on the ground floor in the north west corner of the mill building. Circuit control panels are located in the SAG mill control room, the central control room, the vanadium roaster control room and the AMV area.

#### b) *Fire Protection System*

The main mill building fire protection systems include:

- portable dry chemical extinguishers strategically located throughout the building; and
- water hoses throughout the building.

For fire hydrant and hose cabinet locations in the mill building refer to the Fire System Schematic included as Figure 1 of this Plan.

### **1.2.8 Maintenance Shop/Warehouse/Change Room Building**

This building (approximately 20,000 square feet) contains the main maintenance shop area (located on the north end of the building), the main warehouse (located on the south end of the building) and the personnel change rooms and lunch/training room (located on the extreme south end of the building on the ground and second floors).

Within the maintenance shop area are the following work area and specialty shops:

- the main maintenance shop area contains welding and cutting equipment, lathes, presses, and drill presses;
- a carpenter shop which contains various saws and planes. Fiberglass work is also done within this shop area and it is located at the northwest end of the maintenance shop area;
- an electrical shop which is located south of the carpenter shop;
- a heavy equipment maintenance shop area is located at the north end of the maintenance shop in the center of the building;
- a rubber room for rubber lining of equipment is located east of the equipment shop area; and
- the maintenance shop office, instrument shop and tool room are located at the south end of the maintenance shop area.

The warehouse area contains primarily dry good storage for repair parts and consumables for the operation of the Mill. There is an electrical water heater for the change room which is located in the warehouse area at the south end.

Within the warehouse and maintenance shops there are some oils and chemicals stored in the following locations:

- small quantities of flammable material such as starting fluid and spray paint are kept in the warehouse;
- drums of new oil and anti-freeze are stored along the east wall of the equipment maintenance area and on the east side of the warehouse on oil storage racks;
- used oil is stored in a tank located northeast of the equipment shop. The tank has a capacity of approximately 5,800 gallons;
- in the main maintenance shop area and the rubber room there are flammable storage cabinets and east of the warehouse there is a trailer which is used to store flammable items such as rubber cements, paints and fiberglass resins; and
- compressed gas cylinder storage, both empty and full is located outside, east of the maintenance shop.

a) *Electrical*

The main electrical circuit breaker for the maintenance shop and warehouse building is located on the east wall inside the Maintenance shop. Auxiliary electrical panels for the change room and warehouse are located in the southwest corner of the warehouse area.

b) *Fire Protection System*

The fire protection system within the maintenance shop/warehouse/change room building includes:

- “wet” automatic sprinkler system that releases at 212° F; and
- portable dry chemical extinguishers strategically located throughout the maintenance area, warehouse area and the change room and lunch room.

For fire hydrant and hose cabinet locations refer to the Fire System Schematic (Figure 1).

### **1.2.9 Reagent and Fuel Storage**

The following lists the reagents and fuel stored at the Mill site:

- a sulfuric acid tank located northwest of the mill building which has a capacity of approximately 1.4 million gallons;
- a storage tank for propane is located on the north edge of the Mill site, northwest of the mill building. It has a storage capacity of 30,000 gallons;
- four sodium chlorate tanks located east of the SX building, north of the office building and south of the pulp storage tanks. The two tanks east of the SX building are for sodium chlorate storage and the other two tanks are for dilution of the sodium chlorate;
- two anhydrous ammonia tanks located east of the SX building, with capacity of 31,409 gallons each;
- three kerosene tanks located east of the SX building, with a capacity of 10,152 gallons each;
- one caustic soda tank north of the SX building, with a capacity of 19,904 gallons; and
- three soda ash tanks which are located east of the SX building. One tank is the dry soda ash tank with a capacity of 70,256 gallons. Two of the tanks are soda ash dilution tanks with capacities of 16,921 gallons each;
- two salt tanks, one loading and one dilution, north of the SX building;
- an ammonium sulfate storage tank east of the mill building, directly south of the pulp storage tanks; and
- diesel fuel and gasoline are stored in two tanks located on the eastern side of the ore pad. The gasoline storage capacity is 3,200 gallons, while diesel storage capacity is 8,000 gallons.

Other reagents are stored in steel barrels or super sacks in a reagent yard located west of the office building. Typical reagents which are stored in this yard include:

- polymers and flocculants;
- boiler feed water chemicals;
- methanol;
- tributyl phosphate;
- hydrogen peroxide;
- "dirty" soda ash and ammonium sulfate;
- SX amines and emulsion breakers;
- decyl alcohol;
- minimal amounts of acid in barrels; and
- used oil in drums and overpacks.

### **1.2.10 Boiler Facilities**

The main building (approximately 12,400 square feet) is located on the west side of the Mill site and contains air compressors and water treatment facilities. To the north of the main building is a building which houses the propane-fired boilers. The vanadium oxidation tank, oxidation thickener, and pH adjustment tank are located south of the boiler house facilities.

#### *a) Electrical*

The main electrical panel for the boiler facilities is located outside of the building, on the south wall.

#### *b) Fire Protection System*

The fire protection system for the boiler facilities is comprised of strategically located portable dry chemical extinguishers.

### **1.2.11 Sample Plant**

The sample plant building (approximately 8,000 square feet) is located on the ore pad, east of the maintenance shop/warehouse building. The sampling plant equipment has been removed from the building and it is currently used as a storage area for maintenance.

#### *a) Electrical*

The electrical panel for the sample plant building is located on the east wall upstairs.

#### *b) Fire Protection System*

There are no extinguishers or sprinkler systems in the sample plant.

### 1.2.12 Tailings Cells and Roberts Pond

Tailings and wastes generated from processing conventional ores and alternate feed materials are disposed of permanently in the Mill's lined tailings impoundments. The Mill's tailings cells are comprised of four below grade engineered cells, Cell 1, 2, 3 and 4A. Liquids are stored in Cell 1, Cell 3 and Cell 4A the active tailings cell. The liquid in the tailings cells is very acidic. It also contains virtually all of the radionuclides contained in the ores and alternate feed materials that are processed at the Mill, other than uranium, which is included in the tailings at approximately 5% of its concentration in the ores and alternate feed materials.

In addition to the tailings cells, there is also an emergency lined catchment basin (Roberts Pond) west of the mill building. Solutions in this basin or the tailings cells should not be used to fight fires in the Mill facility.

### 1.2.13 Stack Heights, Diameters and Typical Flow Rates

Emissions from the Mill process are in the form of air emissions from exhaust stacks and solid/liquid tailings which are stored in the Mill's tailings cells located west/southwest of the main Mill building. The major exhaust stack parameters are shown in the following table.

Description	Height (ft from surface)	Diameter (inches)	Estimated Flow Rate (cfm)
Leach Exhaust	~100	36	13,700
Yellow Cake Drying (3 stacks)	~85	18	4,000 per stack
Vanadium Roasting & Fusion	~85	38	4100

There are also smaller exhaust stacks associated with the Laboratory in the Mill Office building and the boiler exhaust stack.

### 1.2.14 Main Shut-Off Valves

The main shut-off valves and their locations are indicated on Exhibit 7.

## 1.3 Description of Area Near the Site

The site and surrounding area are indicated on the general area map included as Exhibit 4 and on the Drainage Map indicated on Exhibit 5.

The Mill lies within a region designated as the Canyon Lands section of the Colorado Plateau physiographic province. Elevations in the region range from approximately 3,000 feet in the bottom of canyons to over 11,000 feet among the peaks of the Henry, Abajo and La Sal Mountains. The average elevation for the area, excluding deeper canyons and isolated mountain peaks is about 5,000 feet. The average elevation at the Mill site is approximately 5,600 feet above mean sea level.

Although varying somewhat with elevation and terrain, the climate in the vicinity of the Mill can be considered as semi-arid with normal annual precipitation of about 13.4 inches. Primary land uses in the region include livestock grazing, wildlife range, recreation, and exploration of minerals, oil and gas. The area within 5 miles of the Mill site is predominantly range land owned by residents of Blanding or of the White Mesa Ute community of the Ute Mountain Ute Tribe.

There are no perennial surface waters on or in the vicinity of the Mill site. Corral Creek, located east of the site is an intermittent tributary to Recapture Creek. Westwater Creek is an intermittent tributary of Cottonwood Wash, with its confluence with Cottonwood Wash located 1.5 miles west of the Mill site. Both Recapture Creek and Cottonwood wash are similarly intermittent. They both drain to the south and are tributaries to the San Juan River approximately 18 miles south of the Mill Site.

The Mill site is near US Highway 191 and can be accessed by a paved access road from the highway to the Mill facilities. This would be the primary route for access of emergency equipment and evacuation. A municipal airport is also located approximately 3 miles north of the Mill site. There are no significant potential impediments to traffic flow in the area, such as rivers, drawbridges, railroad grade crossings, etc.

The nearest residence to the Mill is approximately 1.2 miles to the north of the Mill, the next is a residence approximately two miles north of the Mill, followed by the community of White Mesa, about 3.5 miles to the south. The City of Blanding is located approximately 6 miles to the northeast. Exhibit 6 shows these population centers.

The local fire station and police station are located in Blanding, Utah. Blanding also has a medical clinic. The closest hospital is located in Monticello, Utah, approximately 30 miles north of the Mill. St. Mary's hospital in Grand Junction, Colorado, approximately 3 hours drive by highway, is the nearest trauma center. Specialized medical attention for radioactive contamination or chemical exposure would be located either in Salt Lake City at the University of Utah Medical Center (approximately 5 hours drive by highway), or in Denver, Colorado (approximately 7 hours drive by highway).

There are no facilities close to the Mill site that could present potential protective action problems. All schools, arenas, stadiums, prisons, nursing homes and hospitals are located in Blanding, approximately 6 miles north of the Mill site.

There are no sites of potential emergency significance such as liquefied petroleum gas (LPG) terminals, chemical plants, pipelines, electrical transformers and underground cables in the vicinity of the Mill, other than Mill site facilities described in detail in Section 1.2 above.

## **2. TYPES OF ACCIDENTS**

### **2.1 Description of Postulated Accidents**

The following is a description of each type of radioactive materials and other accident that could potentially occur at the Mill site that could require an emergency response.

#### **2.1.1 Unloading, Storage of Ammonia**

A release of anhydrous ammonia could occur through tank failure, overfilling, and failures of piping, loading hoses, hose couplings, and emergency relief valves.

No radiological impacts are foreseen from a release of anhydrous ammonia. However, in the event of an ammonia tank spill, the material would be expected to evaporate quickly. Release of the entire contents of one or both of the onsite ammonia tanks during a short period of time could result in a significant release to the environment (the atmosphere) of a hazardous material that could require a response by an offsite organization to protect persons offsite. Such a release is addressed in the Mill's Risk Management Plan, required under Section 112r of the Clean Air Act, a copy of which plan is attached hereto as Appendix K. The Risk Management Plan contemplates a worst case scenario of the release of the entire 140,000 pound contents of one of the anhydrous ammonia tanks over a 10 minute period, which could result in a dangerous cloud of anhydrous ammonia that could extend 12 miles from the point of origin at the Mill. An alternate scenario of a release of 500 pounds of ammonia over a one minute period could result in a dangerous cloud of anhydrous ammonia that extends 0.8 miles from the point of origin.

Therefore, an uncontrolled release of ammonia that could result in the release of 100 or more pounds of ammonia is classified as a Site Area Emergency. Any other uncontrolled release of ammonia, other than a minor release, is classified as an Alert. A minor release of ammonia is classified as an On-Site Emergency. See Section 3 below for a discussion of the significance of these classifications.

A minor release of ammonia would be any release that is expected to be of a small amount (less than 7 gallons (35 pounds)) that is not expected to be uncontrolled. Minor releases of ammonia are not subject to the notification requirements of this Plan; however they are subject to the procedures for response to an ammonia release outlined in Appendix A.

The procedures for response to an ammonia release are outlined in Appendix A. An uncontrolled release of 100 pounds (20 gallons) or more of anhydrous ammonia would also require that notice be given to the Community Emergency Coordinator for the local Emergency Planning Committee under the Emergency Response and Community Right to Know Act (see Section 10 below). The procedures for giving such notifications are also set out in Appendix A to this Plan.

#### **2.1.2 Ammonia Explosion in a Building**

An ammonia-air explosive mixture could be formed inside the Mill and SX buildings if a line

ruptured. Existing controls include emergency powered vent fans, operator presence at all times for surveillance, and one-inch piping that minimizes potential release amounts.

Radiological impacts from the explosion would be minimal and most likely contained within the restricted area, unless the explosion resulted in a fire (see Sections 2.1.6 and 2.1.7 below for the emergency response procedures to follow in the event of a fire). An ammonia explosion would be classified as a Site Area Emergency if it involved the uncontrolled release of greater than 100lbs of anhydrous ammonia, and as an Alert if it involved an uncontrolled release of 35 pounds (7 gallons) to 100 pounds (20 gallons) of anhydrous ammonia. Releases of less than 7 gallons are classified as On-Site Emergencies (see Section 3 for significance of this classification). Any contamination would be recycled or disposed of, as appropriate.

The procedure for response to an ammonia explosion are set out in Appendix B.

### **2.1.3 Unloading/Storage of Propane/Propane Fire or Explosion**

A release of propane could occur through tank failure, overfilling, and failures of piping, loading hoses, hose couplings, and emergency relief valves.

Daily inspections of the propane tank for leaks and integrity are conducted to minimize potential hazards associated with propane leaks.

No radiological impacts are predicted for a release of propane, unless the release is associated with a fire. Inhalation of propane is also less a hazard than inhalation of ammonia, and would not be expected to be a significant threat to the public, although it could pose hazards to workers in the immediate vicinity of the release. Vapors can cause dizziness or asphyxiation without warning.

However, there is a significant risk of fire or explosion in the event that the release was uncontrolled and the propane was ignited. Such a release is addressed in the Mill's Risk Management Plan, required under Section 112r of the Clean Air Act, a copy of which plan is attached hereto as Appendix K. The Risk Management Plan contemplates a worst case scenario of the release of 110,000 pounds of propane, resulting in a vapor cloud explosion extending 0.40 miles from the point of origin. An alternate scenario of a release of 500 pounds of propane could result in a vapor cloud explosion extending 0.01 miles from the point of origin. The propane tank is located approximately 0.5 miles from Highway 191 and the nearest Mill property boundary, so a propane explosion is unlikely to have direct offsite impacts. However, as a matter of caution, notice is provided to offsite authorities.

An uncontrolled release of propane that could result in the possibility of an explosion is classified as an Alert. A minor release of propane (see below) is classified as an On-Site Emergency. See Section 3 below for a discussion of the significance of these classifications.

A minor release of propane would be any release that is expected to be of a small amount and that is not expected to be uncontrolled or pose a risk of explosion. Minor releases of propane are

not subject to the notification requirements of this plan; however, they are subject to the procedures set out in Appendix C.

The procedures for response to a propane release are outlined as Appendix C.

#### **2.1.4 Leach Tank Failure**

The rubber lined leach tanks contain the nearly boiling ore/sulfuric acid slurry. Tank failure due to corrosion and break-out is a possibility. Procedures and practices are in place and functioning to minimize this possibility. Failure due to loss of structural integrity is also possible. The tanks are evaluated as required to determine structural stability and the potential need for replacement.

Radiological impacts are minimal from an occurrence of this type. Any release of material would be contained in the leach area or would flow to the lined catchment basin (Roberts Pond) west of the Mill for containment, as designed.

Accidents of this type are classified as On-Site Emergencies. See Section 3 for the significance of this classification.

The procedures for response to a leach tank failure are outlined in Appendix C and in the Mill's Spill Prevention, Control, and Countermeasures Plan For Chemicals and Petroleum Products (the Spill Response Plan"), a copy of which is attached as Appendix L to this Plan.

#### **2.1.5 Sulfuric Acid Storage Tank Failure**

The Mill's sulfuric acid storage tanks consist of one large above ground tank that can hold up to 1,600,000 gallons and two smaller tanks with capacities of 269,160 gallons each. Tank failure due to corrosion and break out is possible. Failure due to loss of structural integrity, as well as failures of piping, loading hoses, hose couplings, and emergency relief valves.

A sulfuric acid tank spill would flow via an above ground path to tailings Cell 1 or to Roberts Pond.

There would be no radiological impacts associated with an accident of this type. Nor would there be any significant hazards to the environment from off gases from any such release. However, there would be potential hazards to workers in the close vicinity from contact with sulfuric acid or inhalation of sulfuric acid vapors, and a release to the surface soils.

The large tank is equipped with a high level audible alarm which sounds prior to tank overflows. The two smaller tanks are also equipped with high level audible alarms.

Accidents of this type are classified as On-Site Emergencies, because they will not lead to a significant release to the environment of radioactive or other hazardous material. See Section 3 below for the significance of this classification.

The procedures for response to a sulfuric acid tank failure are outlined in Appendix D and in the

## Mill's Spill Response Plan.

### 2.1.6 SX Fire

The possibility of a major fire in the solvent extraction building is remote, as very strict safety precautions are adhered to. This part of the process is kept isolated and in separate buildings due to the large quantities of kerosene present. These facilities are equipped with an independent fire detection and protection system. In the event of a fire in the solvent extraction building, the fire suppression system delivers foam to the affected area. The foam is designed to spray for 25 minutes, followed by water at 100 psig and up to 2,000 gpm.

In spite of the safety precautions, a major fire in the solvent extraction building could occur. NRC staff concluded in NUREG-1140 that a fire in the solvent extraction circuit is the accident of greatest significance for emergency preparedness for a uranium mill, from the point of view of potential radiological impacts offsite. However, NRC staff concluded that the calculated dose from this type of accident is small (0.1 rem or less) because of the very low specific activity of the uranium and the low volatility of the uranium compounds, which causes a low release fraction. NRC staff noted that these low release fractions are the reason why no offsite ground contamination was ever detected due to the historic fires that have occurred at other uranium mills. In the 1980s, two solvent extraction fires occurred at other uranium Mills. Neither fire resulted in appreciable release of uranium to the unrestricted environment, and essentially complete recovery of the uranium was obtained.

As a result, NRC staff concluded in NUREG-1140 that no credible accident would justify emergency protective actions because radiation doses to the public offsite from an accident would be below the EPA's protective action guides. Also, the quantity of uranium inhaled is below the quantity where chemical toxicity effects are observed. Thus, neither radiation doses nor chemical toxicity from licensed materials is a concern with respect to the need for prompt protective actions.

If a major fire were to occur, the radiological environmental effects would be confined within a few hundred feet of the buildings. Recovery of uranium that would be scattered by the burning solvent would be accomplished. Uranium-contaminated soil would be processed in the Mill circuit or disposed of in the Mill's tailings cells, as appropriate. The Mill would be required by existing regulations to take certain actions. Among these, the Mill would be required by 10 CFR 20.201(b) to conduct surveys (offsite if appropriate) to determine whether the NRC's limits on radioactivity in effluents to unrestricted areas in 10 CFR 20.106 were exceeded. A major fire would also require immediate notification of the Executive Secretary by telephone (10 CFR 20.403)

Consequently, the impact from such an event at the Mill would be limited to (1) cleanup of contaminated material, (2) replacement of destroyed Mill components, and (3) a short duration release of combustion products to the atmosphere.

A major SX fire is classified as an Alert. See Section 3 for the significance of this classification.

The procedures for response to an SX fire are outlined in Appendix E.

### **2.1.7 Other Fire**

A fire could start anywhere in or around Mill facilities as a result of a number of causes, such as lightning strikes, electrical malfunction, human error etc. However, at the Mill there is an increased risk of fire and of severe onsite or offsite consequences in the following areas, due to the nature of the chemicals stored or used at those areas:

- SX Building (see Section 2.1.6 above);
- Propane Tanks (see Section 2.1.3 above); and
- Lab or Lab Storage Area.

Fires could start in these areas due to equipment malfunction or human error and the intensity and consequences of the fire could be severe, although direct radiological hazard from any such fires would be expected to be relatively low (see Section 2.1.6 for a discussion of the radiological impacts of an SX fire, which is the type of accident considered to have the highest risk of radiological impacts at a uranium mill). To the extent that facilities are damaged as a result of any such fire, there could be secondary radiological hazards, such as fire damage in the yellowcake product drying, packaging and storage areas that would have to be evaluated.

As discussed in Section 2.1.6 above, an uncontrolled fire in the SX building is classified as an Alert. All other uncontrolled fires in Mill buildings are classified as On-Site Emergencies. See Section 3 for a discussion of the significance of these classifications.

Should a fire (other than an SX fire) occur, the procedure outlined in Appendix F for reporting and responding to fires will be followed (the procedure to be followed for an SX fire is outlined in Appendix E).

### **2.1.8 Tornado**

Although this is highly unlikely, a tornado could occur at the Mill. A severe tornado could cause buildings and other structures to collapse, chemical or gas releases, major fires as well as general panic. The environmental impacts from a tornado could be the transport of tailings solids and liquids, ores or product from the Mill area into the environment. This dispersed material would contain some uranium, radium, and thorium. An increase in background radiation could result, and, if sufficient quantities are detected and isolated, they would be cleaned up. However, NRC staff have concluded in NUREG-1140 that while tornadoes could release a large amount of radioactive material, they spread the material so greatly that resulting doses are very small. As a result, tornadoes are not discussed further in NUREG-1140 and are not considered to be a significant radiological risk at uranium mills.

However, to the extent that a tornado has caused or is likely to result in an ammonia leak or propane release, an SX building fire or a breach of the Mill's tailings cells, it would be classified as a Site Area Emergency or Alert depending on which one of these other accidents resulted from the tornado. All other tornadoes would be classified as On-Site Emergencies. See Section 3

below for the significance of these classifications.

In the event of a major tornado, the procedures outlined in Appendix G will be followed.

### **2.1.9 Major Earthquake**

Although this is highly unlikely, an earthquake could occur at the Mill. A severe earthquake could cause buildings and other structures to collapse, chemical and/or gas releases, major fires as well as general panic. NRC staff concluded in NUREG-1140 that earthquakes were not identified as leading to significant releases of radionuclides unless they were followed by a fire.

To the extent that an earthquake has caused or is likely to result in an ammonia leak or propane release, an SX building fire or a breach of the Mill's tailings cells, it would be classified as a Site Area Emergency or Alert, depending on which one of these accidents resulted from the earthquake. All other major earthquakes would be classified as On-Site Emergencies. See Section 3 for the significance of these classifications.

In the event of a major earthquake the procedures outlined in Appendix G will be followed.

### **2.1.10 Tailings Accidents**

#### **2.1.10.1 Flood Water Breaching of Retention System**

In general, flood water breaching of tailings embankments presents one of the greatest dangers for the sudden release of tailings solids and impounded water. The tailings cells are designed with sufficient freeboard (at least three feet) to withstand back-to-back 100-year storm events or 40% of the probable maximum flood (PMF) followed by the 100-year storm event. The flood design is equivalent to 15 inches of rainfall. In addition, the tailings dikes were designed in accordance with NRC regulations and allow a sufficient margin of safety even in the event of an earthquake.

The possibility of floods in Westwater Creek, Corral Creek, or Cottonwood Wash causing damage to the tailings retention facility is extremely remote. This is due to the approximately 200 foot elevation difference between the streambeds of the creeks and the toe of the tailings dikes.

Flood water breaching a tailings embankment is classified as an On-Site Emergency, because it is unlikely that any releases to the environment will leave the Mill property, and in the event that any contamination were to leave the property, it is unlikely that the release is expected to require a response by an offsite response organization to protect persons offsite. See Section 3 below for the significance of this classification.

In the event of a Flood Water Breach of the tailings retention system, to procedures in Appendix H will be followed.

### 2.1.10.2 Structural Failure of Tailings Dikes

All tailings dikes have been designed with an ample margin of safety as per NRC regulations. This has included design calculations showing dike stability even when the dike is saturated with moisture during a seismic event, the most severe failure mode. In addition, the tailings discharge system is checked at least once per shift during operation, or once per day during Mill standby.

NRC staff concluded in NUREG-1140 that tailings pond failures also release a large quantity of material. However, NRC staff concluded that rapid emergency response is not needed to avoid doses exceeding protection action guides because dose rates at a spill site are very low. NRC staff concluded that an appropriate response is to monitor drinking water, especially for radium-226, to be sure that drinking water standards are met. Gamma ray monitoring of the ground is also appropriate to determine where the tailings have been deposited. However, NRC staff concluded that ground contamination presents little immediate hazard to the public because the gamma dose rates are low. Gamma dose rates in contact with tailings should be less than 0.1 mR/hr. A clean-up of the spilled tailings would be expected, but this could be done effectively without pre-existing emergency preparedness.

Although the discharge from a dike failure would soon cross the restricted area boundary, the flow path is over three miles in length before leaving the Mill property. In the event of a dam failure, large operating equipment will be mobilized to construct temporary earthen dikes or berms downgradient to the failed dike. In addition, the State of Utah, Division of Radiation Control Executive Secretary (the "Executive Secretary), MSHA, and State of Utah, Department of Natural Resources, Division of Dam Safety will be notified. The contamination from such an event would be cleaned up and returned to the tailings area.

A tailings dam failure is classified as an On-Site Emergency, because it is unlikely that any releases to the environment will leave the Mill property, and in the event that any contamination were to leave the property, it is unlikely that the release is expected to require a response by an offsite response organization to protect persons offsite. See Section 3 for the significance of this classification.

In the event of a tailings dam failure the procedures outlined in Appendix H will be followed.

### 2.1.10.3 Seismic Damage to Transport System

In the event of a seismic rupture of a tailings slurry pipeline, the released slurry will be contained in the tailings cells regardless of the quantity released. The tailings retention system pipe is in the same drainage basin as the retention system. Any tailings slurry released by a pipe rupture, no matter what the cause, would flow downhill where it would be impounded inside a tailings cell.

If a break occurred, the pumping system would be shut off, personnel removed from the immediate area, and the Executive Secretary notified. The break would be repaired and the affected area cleaned up in the safest and most expeditious manner. The advice and direction of the Executive Secretary would be sought and heeded throughout the episode.

A seismic rupture in the tailings slurry pipeline would be classified as an On-Site Emergency. See Section 3 for the significance of this classification.

In the event of a rupture in the tailings slurry pipeline the procedures outlined in Appendix H will be followed.

#### **2.1.11 Terrorist/Bomb Threat**

In the event that any person should receive a threat of a bomb, the procedure set out in Appendix I should be followed.

Because of the unknown nature of the risk, a terrorist/bomb threat is classified as an Alert. See Section 3 for the significance of this classification.

In the event of a terrorist/bomb threat, the procedures in Appendix I will be followed.

#### **2.1.12 Chemical or Reagent Spills**

Tanks which are likely to overflow are equipped with high level alarms to reduce the possibility of spillage due to tank overflow and dikes and/or curbs are constructed around process and storage tanks (excluding the water tank) to confine the material in the event of a tank spill. However, as an operating facility, it is possible for spills of chemicals or reagents to occur from time to time. Unless such a spill qualifies as an ammonia release (see Section 2.1.1 above), a propane release (see Section 2.1.3 above) or a sulfuric acid release (see Section 2.1.5 above), the spill will be considered a minor spill and will be addressed and cleaned up in accordance with the Mill's Spill Response Plan.

It is unlikely that any such minor spills will impact the environment if cleaned up in accordance with the Mill's Spill Response Plan. The entire Mill facility is graded such that run-off will drain into the Mill's tailings cells.

A copy of the Mill's Spill Response Plan is included as Appendix L to this Plan.

Any such minor spills are classified as Non-Subject Incidents. See Section 3 for the significance of this classification.

#### **2.1.13 Transportation Accident on the Mill Property Involving a Spill of Yellowcake**

In the event of a transportation-related accident on the Mill property involving a spill of yellowcake, immediate containment of the product will be achieved by covering the spill area with a plastic sheeting or equivalent material to prevent wind and water erosion. If sheeting is not available, and depending on where the spill occurs, soil from the surrounding area may be used. Perimeter ditching will be used to contain the spill if it should occur in an area where runoff could result from precipitation.

All human and vehicular traffic through the spill area will be restricted. The area would be cordoned off if possible. All persons not participating in the accident response will be restricted to 50 feet from the accident site. Local law enforcement officers will be notified and may be asked to assist in controlling traffic and keeping unauthorized persons out of the spill area.

Covered containers and removal equipment, i.e., large plastic sheeting, radioactive signs, ropes, hoses, shovels, vacuums, axes, stakes, heavy equipment (front-end loaders, graders, etc.), will be available to clean up the yellowcake. A Radioactive Material Spill Kit is available and under the control of the Radiation Department. If conditions warrant, water will be applied to the spilled yellowcake in a fine spray to assist in dust abatement.

Gloves, protective clothing and any personal clothing contaminated during cleanup operations will be encased in plastic bags and kept in the plant area for decontamination or disposal.

Any fire at the site will be controlled by local experienced fire fighting personnel wearing appropriate respiratory protective equipment.

Response team members will have a thorough knowledge in basic first aid and of the physical hazards in inhalation, ingestion, or absorption of radionuclides. Team members will adequately protect themselves.

As per R313-15 requirements, the Executive Secretary will be notified promptly of any accident of this type.

Any minor spills are classified as Non-Subject Incidents. See Section 3 for the significance of this classification.

## **2.1.14 Offsite Transportation Accidents**

### **2.1.14.1 Concentrate Shipments**

Concentrates will be shipped in sealed 55-gallon drums built to withstand normal handling and minor accidents. Each drum will contain approximately 900 pounds of yellowcake. A maximum of 45 drums will be shipped in each closed van. The drums will be sealed and marked "Radioactive LSA" (low specific activity), and the trucks will be properly marked. Because most of the radioactive daughter products of uranium are removed in the extraction process and radioactive buildup of daughter products is slow, yellowcake has a very low level of radioactivity and is therefore classified by the Department of Transportation as a low specific activity material.

The environmental impact of a transportation accident involving release of the product would be minimal. Yellowcake, having a high density, even in a severe accident in which multiple drums are breached, would not easily disperse. More than likely, the drums and any released material would remain within the damaged vehicle or in an area of close proximity of the accident site.

Driver or carrier instructions are given to each driver of each transport leaving the plant site with a load of yellowcake. These instructions will consist of an explanation of the product, preliminary precautions at the accident site, whom to notify and what to do in case of fire. A copy of these instructions is included in the Mill's Transportation Accidents Plan, a copy of

which is attached as Appendix M to this Plan.

Mill personnel would respond if requested for the initial spill response to handle any yellowcake transport accident. A procedure for this likelihood is included in the Mill's Transportation Accidents Plan. DUSA may contract with a carrier or firm properly trained to handle any yellowcake transport accident.

Offsite accidents involving the transportation of product concentrates are classified as Non-Subject Incidents. See Section 3 for the significance of this classification.

In the event of an offsite accident involving a spill of yellowcake, the procedures outlined in the Mill's Transportation Accidents Plan, attached as Appendix M hereto, will be followed.

#### *2.1.14.2      Ore or Alternate Feed Material Shipments*

Ore is shipped in 20 to 25 ton shipments in highway trailers that are covered by tarpaulins. The truck trailers are labeled "Radioactive LSA". Because the ore is typically in the form of large particles and is typically wet (2% to 5% moisture), the potential for a significant release from an accident involving an ore shipment truck is quite small.

Alternate feed materials can be transported to the Mill in a number of conveyances. Most typically, alternate feed materials are either shipped in bulk in intermodal containers (either with or without a secondary containment such as a supersac), or in steel drums (possibly in plastic overpacs) in the back of a van trailer. Bulk shipments in intermodal containers are labeled "Radioactive LSA". For bulk materials, the potential release from an accident is similar to potential releases from an accident involving conventional ores, but this may vary depending on the feed material and the manner of conveyance. The potential release from alternate feed materials that are transported in drums will vary, depending on the particular alternate feed material, and in some cases could be equal to or exceed the risks associated with transportation of yellowcake.

In the event of an accident, the transportation company will respond to clean up any spilled material and ensure that the area is clean. Mill personnel will support the transportation contractor in cleaning up the affected area and radiological scanning of the impacted area.

Offsite accidents involving the transportation of ores and alternate feed materials are classified as Non-Subject Incidents. See Section 3 below for the significance of this classification. However, the State of Utah Division of Radiation Control (801-536-4250 during normal business hours or after hours to the UDEQ Duty Officer at 801-536-4123) should be notified as soon as possible, but no later than 24 hours after the incident.

#### *2.1.14.3      Reagent Shipments*

Reagents are shipped in properly marked trailers and the driver are trained in hazardous materials transportation and accident procedures. In the event of an accident, all of the reagent suppliers'

transportation contractors are required to have emergency response contractors to respond to an accident and a potential spill. Many of the reagents that are used at the Mill are shipped on a daily basis to other industrial facilities throughout the United States. The potential for an accident is minimized due to quick response of the transportation contractor's emergency response team and the training of many of the country's emergency response services.

Offsite accidents involving the transportation of reagents are classified as Non-Subject Incidents. See Section 3 below for the significance of this classification. However, the State of Utah Division of Radiation Control (801-536-4250 during normal business hours or after hours to the UDEQ Duty Officer at 801-536-4123) should be notified as soon as possible, but no later than 24 hours after the incident.

## **2.2 Detection of Accidents**

Mill personnel perform a number of daily and weekly inspections of the Mill facilities. These are:

- The Mill's Shift Foremen conduct inspections of all facility areas each operating shift;
- The Mill's RSO or designee performs a daily inspection of all facility areas;
- Mill personnel perform daily, weekly, monthly and quarterly inspection of the Mill's tailings cells; and
- The Mill's RSO or designee perform weekly inspections of all areas of the Mill.

These inspections, particularly the shift and daily inspections provide a means for Mill personnel to detect and alert the Mill's operating staff of any abnormal operating condition or of any other danger to safe operations. These inspections, along with the observations of operating personnel in any impacted area, are the primary means of detecting the accident and alerting the operating staff for chemical or gas leaks, any fires in areas that do not have fire detection equipment, or any impairment to the tailings cells.

For areas of the Mill with fire detection equipment, such as the SX Building, the office building and the Maintenance/Warehouse Building, in addition to the foregoing inspections, the fire detection equipment would be expected to also provide an early warning of a fire.

Tanks which are likely to overflow are equipped with high level alarms to reduce the possibility of spillage due to tank overflow.

For terrorist or bomb threats, the threat itself would provide the means of detection of the incident. Where no threats are given, suspicious activity would be observed during the shift and daily inspections. In addition, the Mill employs surveillance cameras in a limited number of areas, which are intended to allow Mill personnel to monitor product storage areas and certain access points to the facility.

The required responses to any detected accidents are set out in Section 2.1 above and in Appendices A through I for the various types of accidents.

### 3. CLASSIFICATION AND NOTIFICATION OF ACCIDENTS

In this Emergency Response Plan, accidents have been classified into four categories as described below. It should be noted that Reg. Guide 3.67 concludes that fuel cycle and material facilities, such as the Mill, do not present the same degree of hazard (by orders of magnitude) as are presented by nuclear power plants. Thus the classification scheme for the Mill, which has four classes of accidents (Alerts, Site Area Emergencies, On-Site Emergencies and Non-Subject Incidents), is different from the classification scheme for other nuclear facilities, which have two classes of accidents (Site Area Emergencies and Alerts).

Reg. Guide 3.67 provides that “[t]he NRC intends that licensees be allowed to have a single emergency plan that can apply to all licensee needs and regulatory requirements. To this end it should be understood that a licensee may wish to include in the emergency plan some incidents that do not fall within the jurisdiction of the NRC. For example, the licensee may wish to include industrial accidents or fires unrelated to the licensee’s work with nuclear materials. The licensee may include such incidents in the emergency plan.”

As a result, this Plan includes On-Site Emergencies, most of which do not involve risks of offsite releases of radiation and are therefore not specifically required by Reg. Guide 3.67 to be included in an emergency response plan for the Mill, and Non-Subject Incidents, which are incidents that are addressed by other plans (such as the Mill’s Spill Response Plan and Transportation Accidents Plan) and that either involve incidents that could occur on site but that would not involve risks of offsite releases of radionuclides or that involve offsite accidents, and for these reasons are not required by Reg. Guide 3.67 to be included in this Plan. These On-Site Emergencies and Non-Subject Incidents are included in this Plan in order to compile all potential emergencies into one Plan. Although in some cases this merely involves referencing the type of accident or incident and then referring the reader to another plan, the purpose is to allow Mill personnel to have a reference source that will allow them to be able to respond quickly to each type of incident.

#### 3.1 Classification System

At the Mill, there are four classes of accidents, Alerts, Site Area Emergencies, On-Site Emergencies and Non-Subject Incidents, described as follows:

##### a) *Alert*

An Alert is defined as an incident that has led or could lead to a release to the environment of radioactive or other hazardous material, but the release is not expected to require a response by an offsite response organization to protect persons offsite. An Alert reflects mobilization of the Mill’s emergency response organization, either in a standby mode that will activate some portions of the Mill’s organization or full mobilization, but does not indicate an expectation of offsite consequences. However, an Alert may require offsite response organizations to respond to onsite condition such as a fire.

The following potential accidents, are classified as Alerts:

- An uncontrolled release of 35 pounds (7 gallons) or more but less than 100 pounds (20 gallons) of anhydrous ammonia (see Section 2.1.1);
- An ammonia explosion that involves a release of 35 pounds (7 gallons) or more but less than 100 pounds (20 gallons) of anhydrous ammonia (see Section 2.1.2);
- An uncontrolled release of propane that could result in an explosion (see Section 2.1.3);
- A major fire in the SX building (see Section 2.1.6); and
- A terrorist/bomb threat (see Section 2.1.11)

*b) Site Area Emergency*

A Site Area Emergency is defined as an incident that has led or could lead to a significant release to the environment of radioactive or other hazardous material and that could require a response by an offsite organization to protect persons offsite. A Site Area Emergency reflects full mobilization of the Mill's emergency response organization and may result in requests for offsite organizations to respond to the site.

Although it is unlikely that a Site Area Emergency requiring offsite actions will occur at a fuel cycle or materials facility such as the Mill, the Mill must nevertheless be able to recognize potential offsite hazards and make the required notifications in such a manner that offsite response organizations can take appropriate actions, such as sheltering or evacuating persons in the affected area.

Accordingly, the following potential accidents, have been classified as Site Area Emergencies, because they could require a response by an offsite organization to protect persons offsite:

- An uncontrolled release of 100 pounds (20 gallons) or more of anhydrous ammonia (see Section 2.1.1); and
- An ammonia explosion that involves a release of 100 pounds (20 gallons) or more of anhydrous ammonia (see Section 2.1.2).

*c) On-Site Emergency*

An On-Site Emergency is defined as an incident that is of a nature that has not led or could not lead to a significant release to the environment of radioactive or other hazardous material, and hence does not qualify as an Alert or a Site Area Emergency, but that nevertheless could pose significant and unusual safety hazards to workers at the site, and is therefore subject to the procedures under this Plan.

The following potential accidents are or could be classified as On-Site Emergencies:

- A minor release (less than 35 pounds (7 gallons)) of anhydrous ammonia that is not uncontrolled (see Section 2.1.1);

- An ammonia explosion in a building, unless this results in a fire in the SX building, an uncontrolled release of 35 pounds (7 gallons) or more of anhydrous ammonia or an uncontrolled release of propane that could result in an explosion, in which case the classifications applicable to those other incidents would apply (see Section 2.1.2);
- A minor release of propane that is not uncontrolled and could not lead to an explosion (see Section 2.1.3);
- A leach tank failure (see Section 2.1.4);
- A sulfuric acid storage tank failure (see Section 2.1.5);
- A fire (other than a major fire in the SX building) (see Section 2.1.7);
- A tornado, unless this results in a fire in the SX building, an uncontrolled release of anhydrous ammonia or propane, in which case the classifications applicable to those other incidents would apply (see Section 2.1.8);
- A major earthquake, unless this results in a fire in the SX building, an uncontrolled release of anhydrous ammonia or propane, in which case the classifications applicable to those other incidents would apply (see Section 2.1.9); and
- Tailings Accidents
  - A flood water breaching of the tailings retention system (see Section 2.1.10.1)
  - Structural failure of a tailings dike (see Section 2.1.10.2); and
  - Seismic damage to the tailings transportation system (see Section 2.1.10.3).

*d) Non-Subject Incidents*

A Non-Subject Incident is defined as an incident that involves an accident of a specific nature that is covered under a different plan and is not subject to this Plan but is listed in this Plan for informational purposes only.

The following potential incidents are or could be classified as Non-Subject Incidents:

- A chemical or reagent spill (other than a release of anhydrous ammonia or propane, or a sulfuric acid leak or spill). These types of spills are covered by the Mill's Spill Response Plan (see Section 2.1.12);
- A transportation accident on the Mill property involving a spill of yellowcake. These accidents are covered by the Mill's Spill Response Plan (see Section 2.1.13); and
- An offsite transportation accident
  - Concentrate shipments. These types of accidents are covered by the Mill's Transportation Accidents Plan (see Section 2.1.14.1);
  - Ore or alternate feed material shipments (see Section 2.1.14.2); and
  - Reagent Shipments (see Section 2.1.14.3).

### **3.2 Notification and Coordination**

#### **3.2.1 Alert**

The purpose of declaring an Alert is to ensure that emergency personnel are alerted and at their emergency duty stations to mitigate the consequences of the accident, that the emergency is

properly assessed, that offsite officials are notified, and that steps can be taken to escalate the response quickly if necessary.

An Alert, like a Site Area Emergency, differs from an On-Site Emergency or a Non-Subject Incident in that offsite response authorities are notified, as well as the State of Utah Division of Radiation Control. This is because there is a potential for offsite consequences.

The actions to be taken in the event of an Alert vary somewhat depending on the incident. The actions to be taken for each incident described in Section 2.1 above that is classified as an Alert are set out in the various subsections in Section 2.1 and corresponding Appendices A through I to this Plan that relate to the specific incidents. The actions set out in the Appendices describe, to the extent appropriate for each incident, how and by whom the following actions will be taken with respect to each specific incident:

- Decision to declare an Alert (this has been predetermined by incident);
- Activation of onsite emergency response organization;
- Prompt notification of offsite response authorities that an Alert has been declared (normally within 15 minutes of declaring an Alert);
- Notification to the State of Utah Division of Radiation Control immediately after notification of offsite authorities, and in any event within one hour of the declaration of an Alert;
- Decision to initiate any onsite protective actions;
- Decision to escalate to a Site Area Emergency, if appropriate;
- Decision to request support from offsite organizations; and
- Decision to terminate the emergency or enter recovery mode.

### **3.2.2 Site Area Emergency**

The purpose of declaring a Site Area Emergency is to ensure that offsite officials are informed of potential or actual offsite consequences, that offsite officials are provided with recommended actions to protect persons offsite, and that the Mill's response organization is augmented by additional personnel and equipment.

A Site Area Emergency, like an Alert, differs from an On-Site Emergency or a Non-Subject Incident in that offsite response authorities are notified, as well as the State of Utah Division of Radiation Control. This is because there is a potential for offsite consequences. Unlike an Alert, a Site Area Emergency assumes that offsite emergency response assistance will be required.

The Mill has identified only two incidents that should be classified as Site Area Emergencies – an uncontrolled release of 100 pounds (20 gallons) or more of anhydrous ammonia; and an ammonia explosion that involves the release of 100 pounds (20 gallons) or more of anhydrous ammonia. The actions to be taken in the event of such Site Area Emergencies are set out in subsection 2.1.1 above and in Appendices A and B to this Plan, and describe, to the extent appropriate, how and by whom the following actions will be taken:

- Decision to declare a Site Area Emergency (this has been predetermined by incident);
- Activation of onsite emergency response organization;
- Prompt notification of offsite response authorities that a Site Area Emergency has been declared, including recommendation for offsite protective actions (normally within 15 minutes of declaring a Site Area Emergency);
- Notification to the State of Utah Division of Radiation Control immediately after notification of offsite authorities, not later than one hour after the Mill has declared a Site Area Emergency;
- Decision on what onsite protective actions to initiate;
- Decision on what offsite protective actions to recommend;
- Decision to request support from offsite organizations; and
- Decision to terminate the emergency or enter recovery mode.

### **3.3 Information to be Communicated**

Mill personnel will do their best to provide clear, concise information to offsite response organizations. The communication should avoid technical terms and jargon and should be stated to prevent an under- or over-evaluation of the seriousness of the incident.

The procedures set out in the Section 2.1 and Appendices A through I describe the key types of information that will be communicated with respect to facility status, releases of radioactive or other hazardous materials and recommendations for protective actions to be implemented by offsite response organizations, where applicable. Such Appendices also contain the preplanned protective action recommendations the Mill will make to each appropriate offsite organization for each incident that is classified as an Alert or Site Area Emergency, including the size of the area where the actions are to be taken. The Appendices also contain a standard reporting checklist to facilitate timely notifications.

Mill personnel meet annually with the various offsite emergency response providers to ensure that:

- This Plan contains the most practical and efficient protective actions for each postulated accident and that such providers understand and agree with the recommended courses of action; and
- the notifications set out in this Plan are appropriate and the contact information is current.

## **4. RESPONSIBILITIES**

### **4.1 Normal Facility Organization**

The Mill Manager is ultimately responsible for the Mill site. The Mill Manager reports to the Executive Vice President, US Operations of DUSA. The Executive Vice President, US Operations of DUSA reports to the President and Chief Operating Officer of DUSA.

The Mill Superintendent, Maintenance Superintendent and Radiation Safety Officer report directly to the Mill Manager. The Utility Crew, Administrative Staff and Chief Metallurgist also report directly to the Mill Manager.

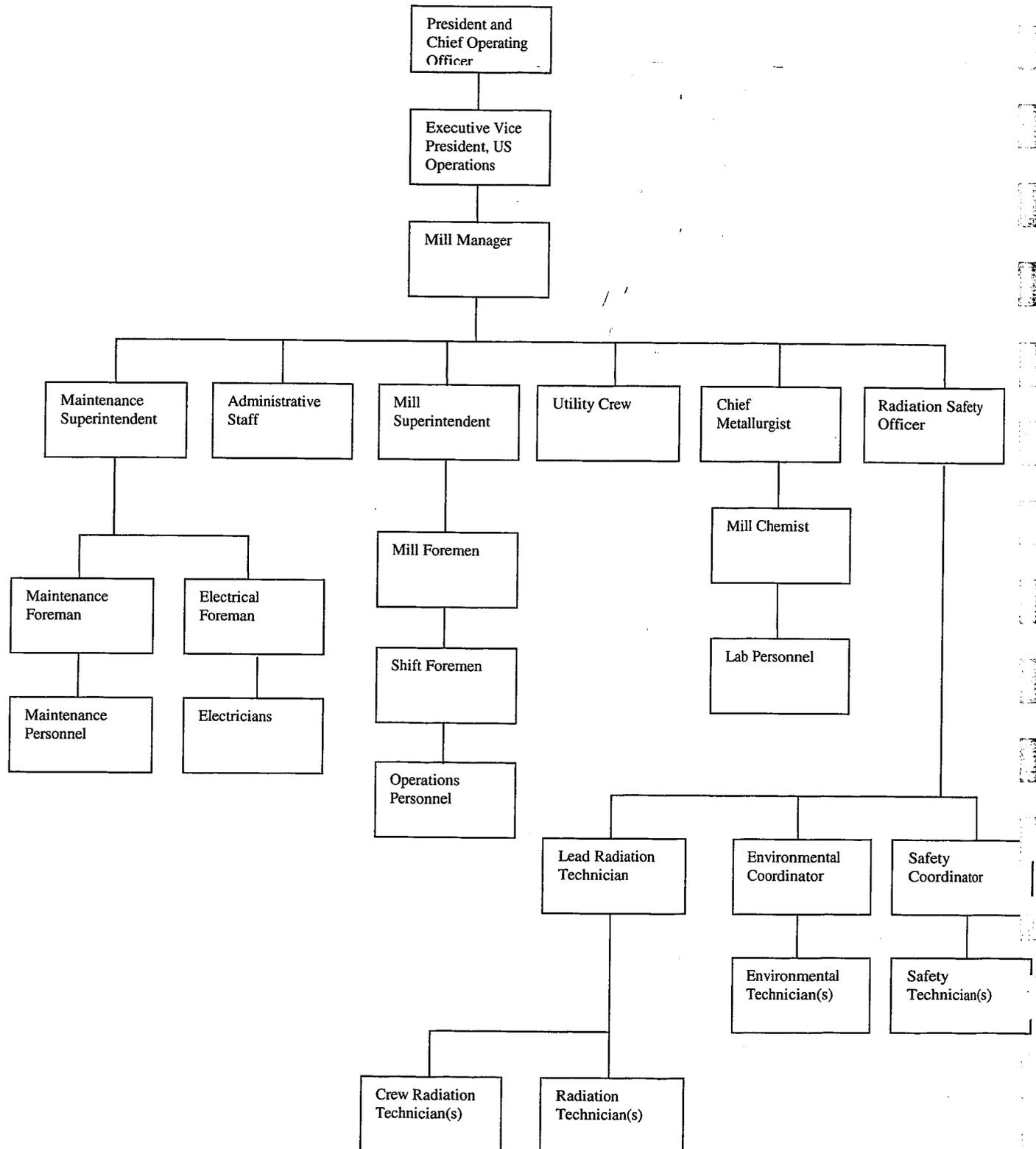
One or more Mill Foremen report to the Mill Superintendent. The number of Mill Foremen will depend on Mill activities. In full operations, there are two Mill Foremen. The Shift Foremen report to the Mill Foremen.

The Radiation Technicians, the Safety Coordinator and his staff and the Environmental Coordinator and his staff report to the Radiation Safety Officer.

The Maintenance Foreman and Electrical Foreman report to the Maintenance Superintendent.

These relationships are indicated on the following diagram:

# MILL ORGANIZATION CHART NORMAL OPERATIONS



The procedures to be followed for the types of possible emergencies that have been identified for the Mill are set out in Section 2.1 above and more specifically in Appendices A through I. The individuals who have the authority and responsibility to declare the various types of emergencies are detailed in Section 2.1 and those Appendices.

## **4.2 Onsite Emergency Response Organization**

The response crew for each operating shift will normally consist of the following operators under the direction of the shift foreman. This organization may be changed for individual shifts subject to the approval of the RSO/Fire Chief.

### **4.2.1 Direction and Coordination**

The Incident Commander will be the Mill Manager, or in his absence, the Mill Superintendent, or in the absence of both the Mill Manager and the Mill Superintendent, the RSO.

The Incident Commander has the overall responsibility for implementing and directing the emergency response. The Incident Commander has the following duties and authorities::

- Control of the situation;
- directing activities during the emergency;
- coordination of staff and offsite personnel who may augment the staff;
- communication with parties requesting information about the event;
- reporting to local, State and Federal authorities;
- authority to request support from offsite agencies;
- termination of the emergency; and
- authority to delegate any of the foregoing responsibilities to:
  - the Mill Superintendent;
  - the RSO; or
  - such other individual or individuals that the Incident Commander deems appropriate in the circumstances.

The Incident Commander will stop routine radio usage upon learning of an emergency and set up the base station in a safe location for directing activities. Radio usage will be limited to the emergency. The Incident Commander has the responsibility to contact or direct others to contact all outside services.

The Incident Commander has the ultimate responsibility to account for all employees at the Mill, using the assistance of supervisors and/or any DUSA personnel. The Incident Commander has the responsibility for the news media and reports directly to the Executive Vice President or President of DUSA.

Shift Foremen are in charge until the Incident Commander arrives and are responsible for all functions listed above. Shift Foremen have the responsibility to account for all of their people in

addition to any visitors, contractors, etc., in their areas and report to the Incident Commander; or, in the absence of the Incident Commander, to administer all of the above duties.

#### **4.2.2 Onsite Staff Emergency Assignments**

The following individuals, organizational group or groups are assigned to the functional areas of emergency activity listed below.

During normal working hours while the Mill is in full operation, all of the individuals or their alternates should be available on site to fulfill their emergency assignments. During evening or night shifts, or during other times when the Mill is not in full operation, not all of the individuals listed below will be on site. However, there will always be a Shift Foreman on site.

Blanding is a small town, and most of the individuals listed below live within a short distance of the Mill. In the event of an emergency during a non-working period, afternoon or night shift, during a period of limited Mill operations or other situation where there is a reduced staff at the Mill, the Shift Foreman (or his supervisor, if on site) will initiate procedures to effect any necessary evacuations of the site and will contact the required personnel from the list of assignments below to assemble the team required in order to fill all of the necessary assignments. Two of the first persons contacted will be the Mill Manager and the RSO, who will ensure that the remainder of the team is assembled in order to carry out the emergency procedures set out in this Plan for the emergency.

##### *a) Facility System Operations*

The Mill Superintendent, or in his absence a Mill Foreman or the Mill Manager, is responsible for all operational activities on the property. In this capacity, the Mill Superintendent, Mill Foreman or Mill Manager can shut down any affected areas within the process and render aid to the other departments.

The Maintenance Superintendent, or in his absence the Maintenance Foreman or the Mill Manager, is responsible for all mechanical and instrumentation on the site and has the ability to gather resources during any declared emergency.

Shift Foremen are in charge until the foregoing personnel arrive and are responsible for all of the foregoing functions until relieved by one or more of the foregoing individuals.

##### *b) Fire Control*

As Fire Chief, the RSO has the responsibility to maintain trained fire crews and operable equipment, mobilize and direct the fire crews and equipment in a fire emergency or one containing the threat of fire, and to assist in evacuation and rescue or recovery operations. The RSO/ Fire Chief makes sure that the team or crew has been established, equipped and properly trained every six months. The RSO/Fire Chief works with the Safety Department and the Safety Coordinator under 30 CFR 56.4330 Firefighting, evacuation, and rescue procedures.

In the absence of the RSO, the Mill Safety Coordinator will assume these duties. If the Safety Coordinator is not present, those responsibilities fall to the next senior member of the Safety Department. Scheduled time off at the Mill is worked around the RSO and Safety Coordinators time off. Both individuals will not be given time off work at the same time, thereby ensuring supervised coverage in the event of an emergency.

During an emergency situation, the Safety Coordinator will also be present and receive direction from the RSO/Fire Chief as to how to proceed. If the RSO is present during the emergency, the Safety Coordinator will act as the Assistant Fire Chief to free up the RSO's time to deal with radiation decontamination or other issues that may arise. If the RSO is not present the Safety Coordinator will be the acting Fire Chief and the radiation designee will act as the Assistant Fire Chief, but will only deal with radiation related issues.

c) *Personnel Evacuation and Accountability*

The Maintenance Supervisor will direct all personnel in evacuation and in activities to cope with the emergency, including isolation of utilities and providing technical advice as needed. The Maintenance Supervisor will be assisted by the Mill Safety Coordinator.

The Laboratory Supervisor has the responsibility to direct and account for all office personnel (including DUSA personnel and office visitors) in evacuation and in activities to cope with the emergency. In case of a mill tour, the Supervisor accompanying the tour will be responsible for evacuation of visitors.

The Scale house person on shift will be responsible to account for ore truck drivers and reagent truck drivers.

The Mill's Emergency Evacuation and Shut-Down Procedure is outlined in Appendix J to this Plan.

d) *Search and Rescue Operations*

The RSO will direct rescue operations and provide the necessary emergency medical personnel and facilities to cope with the emergency.

e) *First Aid*

First aid will initially be the responsibility of the Safety Coordinator or a Safety Technician. If the need for first aid is minimal, there may not be a need to require offsite assistance. However, if there are any significant injuries, or there is a risk of any significant injuries, the Safety Coordinator or a Safety Technician will have the responsibility of contacting offsite medical and ambulance services for assistance.

*f) Communications*

The Incident Commander will stop routine radio usage upon learning of an emergency and set up the base station in a safe location for directing activities. Radio usage will be limited to the emergency. The Incident Commander has the responsibility to contact all outside services.

*g) Radiological Survey and Assessment (Onsite and Offsite)*

On-site and offsite radiological surveys and assessments will be performed by one or more Radiation Technician(s) under the direction of the RSO. The RSO may assist in performing any such surveys.

The surveys and assessments that will be required will depend on the incident. In most cases, radiological contamination resulting from the Mill would be expected to be limited and restricted to the Mill site. In some cases, however, radiological contamination could be dispersed offsite. The RSO will determine what surveys and assessments are required in order to: a) determine to what extent if any, radiological contamination has or could be dispersed offsite as a result of the incident; and b) determine what surveys are necessary in the circumstances to assess any onsite or offsite radiological contamination that may have resulted from the incident. In the absence of the RSO, the Lead Radiation Technician will make these determinations.

The Mill has established an emergency call sheet that will be used in the event of an emergency to alert all members of the department, whether on-site and on-duty or not. When an emergency occurs, the RSO is notified first. If the RSO is not available, the Lead Radiation Technician is notified. The on-shift Radiation Technicians notify the off-shift Radiation Technicians. All Radiation Technicians are required to report to the site to assist in the emergency, unless advised otherwise by the RSO. This ensures that there will be adequate Radiation Safety Staff available for any emergency that may arise.

*h) Personnel Decontamination*

Personnel decontamination will be performed by Mill Radiation Technicians under the direction of the RSO, or in the absence of the RSO, under the direction of the Lead Radiation Technician, as needed.

*i) Facility Decontamination*

Facility decontamination will be performed by Mill operations personnel, maintenance personnel and/or utility crew personnel under the direction of the Mill Manager, Mill Superintendent or Maintenance Superintendent, to decontamination standards set by the RSO and monitored by Radiation Safety Staff.

*j) Facility Security and Access Control*

The Mill Superintendent, or in his absence a Mill Foreman, has the responsibility of directing outside emergency personnel and has the responsibility for plant security and will report directly to the Incident Commander.

*k) Request Support from Offsite Agencies*

During an emergency, the Incident Commander and/or the RSO/Fire Chief will coordinate that the crew or team has the available members needed to respond to the emergency. After the team or crew has responded and is in the process of handling the situation, the Incident Commander and/or RSO/Fire Chief will then coordinate with the Radiation/Safety Departments to maintain scene safety. Scene safety includes, but is not limited to, crowd control, outside emergency assistance requests and any decontamination.

*l) Post-Event Assessment*

A post-event assessment of facility conditions for future operations will be performed by the Mill Manager, Mill Superintendent and/or Maintenance Superintendent. A post-event assessment of facilities for occupational safety will be performed by the Safety Coordinator. A post-event assessment of any on-site or offsite radiological contamination resulting from the incident will be performed by the Radiation Safety Staff under the direction of the RSO.

*m) Recordkeeping*

The RSO will coordinate all record keeping relating to the incident and will be responsible for the preparation of an incident report.

*n) Media Contact*

The Incident Commander, President and Chief Operating Officer or Executive Vice President, US Operations of DUSA shall be the sole media contact in the event of an emergency at the Mill.

#### **4.3 Local Offsite Assistance to Facility**

Under a Letter of Agreement with the San Juan County Emergency Management Office, DUSA will be assisted in the event of an emergency with all needed equipment and services at the disposal of San Juan County. Local agencies have also volunteered services in the event of an emergency. These local agencies are (see Section 4.4 below and Exhibit 1 for contact information):

*a) First Aid and Initial Medical Services*

- Blanding Family Practice Medical Clinic – This facility is located approximately 8 miles north of the Mill in Blanding, Utah; and

- Blanding Clinic – This facility is located approximately 11 miles north of the Mill in Blanding, Utah.
- b) *Ambulance and Paramedic Services*
- San Juan County Ambulance Service – This facility is located approximately 11 miles north of the Mill in Blanding, Utah.
- c) *Fire Department*
- Blanding City Fire Department – This agency is located approximately 9 miles north of the Mill in Blanding, Utah. This agency is a volunteer fire department.
- d) *Law Enforcement*
- Blanding City Police Department – This agency is located approximately 11 miles north of the Mill in Blanding, Utah; and
  - San Juan County Sheriff – This agency is located approximately 30 miles north of the Mill in Monticello, Utah.
- e) *Highway Patrol*
- Utah Highway Patrol – This agency is located approximately 30 miles north of the Mill in Monticello, Utah.
- f) *Hospitals*
- San Juan County Hospital – This facility is located in Monticello, Utah, approximately 33 miles north of the facility; and
  - Blue Mountain Hospital – This facility is under construction and should be available in the Spring of 2009. The facility is located approximately 8 miles north of the Mill in Blanding, Utah.

The Mill has provided all of the foregoing facilities and agencies with Material Safety Data Sheets (MSDS's) for any potential incident at the Mill. These are updated periodically by the Mill. Also, each facility has an understanding with DUSA, that DUSA will perform all radiological assessments and decontaminate any area or equipment that has been contaminated during emergency activities.

Annual visits with each agency or facility are conducted to update and refresh the various departments about potential emergencies that may be encountered. These visits are documented and housed in the Safety Office at the Mill.

Given that Mill personnel will be in attendance at any emergency situation, there is no need to make any provisions to suspend security or safeguard measures for site access during an emergency in order to accommodate any of the agencies referred to above.

#### **4.4 Coordination with Participating Government Agencies**

Below are listed the principal State agency and other government (local, county, State, and Federal) agencies or organizations having responsibilities for radiological or other hazardous material emergencies at the Mill:

- State of Utah, Division of Radiation Control .....801-536-4250 (business hours)
  - After hours call UDEQ Duty Officer at 801-536-4123 (after hours)
- State of Utah, Division of Water Quality .....801-538-6146 (business hours)
  - After hours call the UDEQ 24-hour number at 801-538-6333 (after hours)
- NRC.....301-951-0550
- MSHA Field Off.--801-524-3450 Dist. Off. ....303-231-5465
- MSHA, Arlington .....800-746-1553
- State Emergency Response Comm. ....801-538-3400
- State of Utah, Natural Resources, Dam Safety.....801-538-7200
- National Response Center .....800-424-8802
- Utah Poison Control Center.....800-456-7707
- Blanding City Fire Department.....Dial 911 or 678-2313
- Blanding City Police Department.....Dial 911, 678-2916 or 678-2334
- San Juan County Sheriff, Monticello, Utah.....Dial 911 or 587-2237
- Utah Highway Patrol, Monticello, Utah.....Dial 911 or 587-2000

Mill personnel meet annually with San Juan County Office of Emergency Management and Fire Control and City of Blanding Fire Department to review items of mutual interest, including relevant changes in this Plan. During those meetings Mill personnel discuss the Plan, notification procedures, and overall response coordination, as necessary.

## **5. EMERGENCY RESPONSE MEASURES**

Reg. Guide 3.67 suggests that specific response measures should be identified for each class of emergency and related to action levels or criteria that specify when the measures are to be effected. However, rather than describe specific responses applicable to classes of emergencies, this Plan describes the specific response measures for each type of accident. Since the number of different types of accidents that have been postulated for the Mill is relatively small, it was concluded that this more direct approach is most appropriate for a facility such as the Mill. There is no need to describe the specific actions and responses for each class of emergency when the actual specific response measures can be described more directly for each accident.

Section 2.1 and Appendices A through I set out the specific response measures for each postulated accident.

### **5.1 Activation of Emergency Response Organization**

Activation of the Emergency Response Organization for each type of accident is set out in Section 2.1 and the applicable Appendix A through I.

A contact list is maintained through the Mill Safety Department. All supervisors and key personnel onsite have a copy of this contact list. The individuals listed are available at all times. Blanding is a small town, and most of the individuals listed live within a short distance of the Mill. In the event of an emergency during a non-working period, afternoon or night shift, or during a period of limited Mill operations or other situation where there is a reduced staff at the Mill, the Shift Forman (or his supervisor, if on site) will initiate procedures. In addition, the Radiation Safety Department has established an emergency call sheet that will require notification throughout the department. When an emergency occurs, the RSO/Fire Chief is notified and then the Shift Radiation Technicians notify the off shift Radiation Technicians. The shift Radiation Technicians will maintain scene security until directed by the RSO to do otherwise. When the off duty Radiation Technicians arrive, they will report immediately to the RSO and receive their instructions.

### **5.2 Assessment Actions**

For each type of emergency, the actions to be taken to determine the extent of the problem and to decide what corrective actions may be required are set out in Section 2.1 and the applicable Appendix A through I. Where appropriate, Section 2.1 and the applicable Appendix describe the types and methods of onsite and offsite sampling and monitoring that will be done in case of release of radioactive or other hazardous material. To the extent not specifically addressed in Section 2.1 or in Appendices A through I, Mill personnel will use procedures contained in existing Mill Standard Operating Procedures.

### **5.3 Mitigating Actions**

The means and equipment provided for mitigating the consequences of each type of accident are specified in Section 2.1 and Appendices A through I. To the extent applicable, these include the mitigation of consequences to workers onsite as well as to the public offsite, as well as the criteria that will be used to decide whether a single process or the entire facility will be shut down.

The Mill's Emergency Evacuation and Shut Down Procedure is set out in Appendix J.

### **5.4 Protective Actions**

The nature of onsite and offsite protective actions, the criteria for implementing those actions, the areas involved, and the procedures for notification to affected persons are described in Section 2.1 and Appendices A through I for each type of accident. In order to prevent or minimize exposure to radiation, radioactive materials, and other hazardous materials, the procedures specified in Section 2.1 and those Appendices provide for timely relocation of onsite persons, timely recommendation of offsite actions, effective use of protective equipment and supplies, and use of appropriate contamination control measures, appropriate for each specified type of accident. To the extent that any actions and equipment are described generally in Section 2.1 and those Appendices, Mill personnel will take actions and use equipment in accordance with Mill Standard Operating Procedures.

#### **5.4.1 Onsite Protective Actions**

##### **5.4.1.1 Personnel Evacuation and Accountability**

For each type of accident, Section 2.1 and Appendices A through I include:

- Criteria for ordering an evacuation;
- The means and time required to notify persons involved;
- Evacuation routes, transportation of personnel;
- Locations of onsite and offsite assembly areas;
- Search and rescue;
- Monitoring of evacuees for contamination and control measures if contamination is found;
- Criteria for command center and assembly area evacuation and reestablishment at alternate location;
- Procedures for evacuating and treating injured personnel, including contaminated personnel; and
- Provisions for determining and maintaining the accountability of assembled and evacuated personnel.

#### 5.4.1.2 Use of Protective Equipment and Supplies

Section 2.1 and Appendices A through I specify the required protective equipment and supplies, to the extent not already covered by Mill Standard Operating Procedures. To the extent that Section 2.1 and Appendices A through I do not specify protective equipment and supplies, then protective equipment and supplies normally required or available under existing Mill Standard Operating Procedures for the required procedure or activity will apply.

In addition to normal supplies of equipment at the Mill, such as respirators, protective clothing etc., the Mill maintains supplies of specialized equipment in certain locations for use in emergency situations as follows:

##### *a) Fire Hose*

Fire hose cabinets are located at the following sites with a minimum of 300 feet of 2-1/2" hose, two spanner wrenches, spray nozzles and one hydrant wrench: /

- South of SX;
- West of CCD;
- North of mill building;
- East of pulp storage tanks;
- Northwest of Maintenance Shop;
- West of Warehouse; and
- East of office building.

##### *b) Self Contained Breathing Apparatus*

Two Self-Contained Breathing Apparatus (SCBA) units are located at each of the following locations:

- Hose station east of office building;
- Hose Station South of SX;
- North End SX Outside Wall; and
- North end of mill building, outside wall.

##### *c) Spill Clean-up Equipment*

Barrels of soda ash are located throughout the Mill to be used in case of a chemical spill. Soda ash is also stored in bulk if needed. There are also a few drums of absorbent stored near the laboratory. The laboratory also contains acid spill kits and absorbent materials to be used in case of a spill.

d) *Fire Fighting PPE*

Two complete sets of turnout gear for firefighting and/or emergency extrication are located in the Fire Hose Station located on the east side of the office building.

e) *Maintenance of Emergency Equipment*

Fire extinguishers are inspected on an annual basis, as well as the fire pump system. The Mill Safety Coordinator performs regular spot checks on the emergency equipment locations to ensure that all of the equipment is in place. (Extinguishers are serviced on an annual basis and then checked monthly to make sure units are still charged. The SCBA units are also checked monthly and then pressure tested every five years.)

5.4.1.3 Contamination Control Measures

Because of the nature of potential accidents that can occur at uranium mills, it is unlikely that an accident would result in a significant risk of overexposure to any workers or members of the public (see the conclusions of NRC staff in NUREG-1140 discussed in section 2.1.6 above). Therefore the Mill's existing Standard Operating Procedures are considered adequate for preventing further spread of radioactive materials and for minimizing radiation exposures from radioactive materials that could be unshielded or released by abnormal conditions. Section 2.1 and Appendices A through I describe isolation, area access control, and application of criteria for permitting return to normal use to the extent necessary and not otherwise covered by existing Standard Operating Procedures for the types of accidents that could occur at the Mill

**5.4.2 Offsite Protective Actions**

Section 2.1 and Appendices A through I describe the conditions that would require protective actions offsite for the various types of accidents, and describe the protective action recommendations that would be made to offsite authorities, when each recommendation would be made, and what area offsite would be affected.

**5.5 Exposure Control in Radiological Emergencies**

Given the radioactive materials found at the Mill and the types of postulated accidents, it is not likely that Mill personnel or offsite workers would be exposed to levels of radiation that cannot be adequately addressed under existing Mill Standard Operating Procedures.

**5.5.1 Emergency Radiation Exposure Control Program**

5.5.1.1 Radiation Protection Program

During the emergency situation, the Radiation Protection Manual, SOP Book 9, will be the guide for all decontamination and exposure monitoring.

The Mill's RSO will be responsible for the determination of exposures to be allowed during the event of an emergency situation. This includes the unlikely event of authorizing workers to receive emergency doses and for permitting onsite volunteers to receive radiation doses in the course of carrying out lifesaving and other emergency activities.

#### 5.5.1.2 Exposure Guidelines

The onsite exposure guidelines to be used for all postulated accidents, including actions to control fires, stop releases or protect facilities will be those set out in UAC R313-15 and the Mill's Radiation Protection Manual. These exposure guidelines will also apply to

- Removing injured persons;
- Undertaking mitigating actions;
- Providing onsite first aid;
- Performing personnel decontamination;
- Providing ambulance service; and
- Providing offsite medical treatment.

#### 5.5.1.3 Monitoring

DUSA will provide all needed instrumentation for determining doses received by individuals during all emergency situations. DUSA will also provide OSL badge monitoring to those emergency response individuals during situations that may require extended periods of exposure to high radiation areas.

In the event of an accident, such as an accident that involved the dispersion of yellowcake, or a fire in the SX building or elsewhere on the facility that could involve the dispersion of radioactive materials, breathing zone samples will be taken if practicable in the circumstances.

DUSA emergency personnel will be provided with respiratory protection where appropriate. The Mill does not supply respiratory protection to personnel from offsite response organizations. Those organizations must supply their own respiratory protection. Mill Radiation Safety Staff will advise personnel from offsite organizations of the specific radiological precautions that need to be taken for the various response activities.

Radiation safety personnel will also monitor various areas of the facility occupied by emergency personnel, to the extent practicable.

Bioassays of DUSA and offsite response personnel will be performed as necessary.

Records of dose and dose commitments will be maintained for Mill personnel and offsite support organization's emergency workers involved in the accident.

#### 5.5.1.4 Decontamination of Personnel

Any emergency response equipment that enters the Mill's Restricted Area in response to an incident will be scanned and decontaminated prior to leaving the site according to the requirements found in Table 1 of the NRC's Policy and Guidance Directive FC-85-23, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" issued May 1987.

Any personnel leaving the Mill's restricted area, or otherwise exposed to radiation from the incident, will be scanned and decontaminated in accordance with the procedures set out in the Mill's Radiation Protection Manual for personnel leaving the Mill's restricted area.

Injured personnel will be evaluated for radiation contamination at the earliest convenience, if there is a potential for contamination. Should it be necessary, contaminated articles will be gathered by the radiological staff after medical treatment has been rendered. If the personnel cannot be decontaminated, the clinic/hospital personnel will be notified in advance. Mill radiation safety personnel will be available to provide health physics support clinic/hospital personnel.

#### 5.6 Medical Transportation

One fully-equipped First Responder Unit (Ambulance) is located west of the office building.

Other motor pool vehicles on the property will be utilized as needed in emergency situations with support as needed from the local Emergency Medical Services.

All transportation vehicles will be surveyed and decontaminated by the Radiation Department at the Mill. Any emergency response equipment or personnel that enters the Restricted Area in response to an incident will be scanned and decontaminated prior to leaving the site according to the requirements found in Table 1 of the NRC's Policy and Guidance Directive FC-85-23, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" issued May 1987. If any injured personnel who may also be radiologically contaminated, will be transported to medical treatment facilities, the inside of the transport vehicle will also be scanned and decontaminated in accordance with the foregoing Guidance.

Injured personnel will be evaluated for radiation contamination, if there was a potential for contamination, at the earliest convenience. Should it be necessary, contaminated articles will be gathered by the radiological staff after medical treatment has been rendered. If the personnel cannot be decontaminated, clinic/hospital personnel will be notified in advance.

## **5.7 Medical Treatment**

All medical facilities will be made aware of potential radiological and chemical hazards associated with the postulated accidents described in Section 2.1. St. Mary's hospital in Grand Junction, Colorado, approximately 3 hours drive by highway, is the nearest trauma center. Specialized medical attention for radioactive contamination or chemical exposure would be located either in Salt Lake City at the University of Utah Medical Center (approximately 5 hours drive by highway), or in Denver, Colorado (approximately 7 hours drive by highway).

All facilities are aware that DUSA will take responsibility for the monitoring and potential decontamination of all facilities contaminated during these emergencies. The Mill will provide ambulance and hospital personnel with health physics support if needed.

## **6. EMERGENCY RESPONSE EQUIPMENT AND FACILITIES**

### **6.1 Command Center**

When the evacuation alarm sounds or when personnel are verbally notified by radio or other means, all personnel will assemble at:

- The parking lot south of the office;
- The Scalehouse;
- North side of Tailings Cell 1; or
- North of the Mill.

The assembly site will depend upon conditions, i.e. nature of the emergency, wind conditions, etc. The Incident Commander, RSO/Fire Chief or Shift Foreman will specify the appropriate assembly site.

The Mill does not have a specific communication or assessment center. Key personnel are equipped with handheld VHF transceivers, which will serve as the primary means of communication while personnel are assembling to the designated relocation areas and as needed thereafter to deal with the emergency. The relocation area will serve as the initial assessment center. Other communications and assessment centers will be set up in the Mill's office building, Scalehouse, Warehouse or other areas of the Mill that have communication capability, as needed depending on the nature and location of the emergency.

### **6.2 Communications Equipment**

#### **6.2.1 Onsite Communications**

Employees will be notified to evacuate the area by dialing 184 on any area telephone and announcing that the Mill should be evacuated. This announcement will be repeated three times. When the paging system cycles through, the evacuation siren (continuous frequency) will automatically sound for approximately forty-five seconds, and then automatically shut off, allowing communications by radio from that point. If the 184 number is dialed accidentally the evacuation alarm may be canceled by disconnecting the phone until the page cycle ends, then re-dial 184. (See Exhibits 1 and 2.).

The primary onsite communications will be by radio throughout the course of the emergency and the subsequent recovery. Onsite communication by radio is the typical day-to-day manner of communication within the Mill facility, and is performed by individual hand held VHF transceivers. There is no central relay or similar system that could be disabled in the event of an emergency. As a result, there is no need to provide for an alternative onsite communication system or perform operational tests of that communications system.

### **6.2.2 Offsite Communications**

During an emergency situation, DUSA's onsite ambulance is equipped with a radio to communicate with the San Juan County Dispatch. This service provides a backup means of offsite communication, other than commercial telephone, and will allow the Mill to be in communication with all emergency response services.

Operational tests are conducted on this system periodically during the normal weekly operational checks of the onsite ambulance.

### **6.3 Onsite Medical Facilities**

The Mill maintains medical supplies at the site for typical occupational injuries as required by MSHA.

One fully-equipped First Responder Unit (Ambulance) is located west of the office building.

Other motor pool vehicles on the property will be utilized as needed in emergency situations with support as needed from the local Emergency Medical Services.

Given the types of accidents identified, it is unlikely that any personnel would require contamination control over and above the controls set out in the Mill's Radiation Protection Manual, which would be applied to injured personnel. If it is not possible or there is not sufficient time to decontaminate individuals, then advance notice will be applied to offsite medical personnel and facilities. In addition, Mill personnel will be available to provide health physics assistance to such medical personnel if necessary.

### **6.4 Emergency Monitoring Equipment**

The monitoring equipment used on a day-to-day basis by the Radiation Safety Department will be available to monitor personnel and perform area monitoring, as well as to assess the release of radioactive materials to the environment. As discussed in Section 2.1.6 above, none of the postulated accidents described in Section 2.1 above is expected to release significant quantities of radionuclides into the environment. The greatest risk of that would be a fire in the solvent extraction building, but, as NRC concluded in NUREG-1140 the potential for overexposures offsite would not be significant. Mill personnel will monitor to assess the magnitude and dispersion of any releases after the fact by use of hand held gamma meters in the areas offsite that could have been impacted. The existing high volume particulate stations will also provide some information on the magnitude and dispersion of any such releases.

Onsite area monitoring and personnel scanning will be performed by use of existing monitoring equipment, which is located in the Radiation Safety Department. This is considered to be as "non-hazardous" a location as possible at the site, because it is not located particularly close to any locations that could involve one of the postulated accidents.

Mill Radiation Safety Staff will use dragger tubes primarily to detect dangerous levels of anhydrous ammonia and propane and other chemically toxic materials. If necessary, monitoring personnel will be equipped with SCBA respiratory protection while performing such monitoring.

## **7. MAINTAINING EMERGENCY PREPAREDNESS CAPABILITY**

### **7.1 Written Emergency Plan Procedures**

This Plan will be reviewed annually by the RSO and, if required, updated by the ALARA Committee. The SERP Committee will then validate all changes that are being requested before such changes will be implemented into a new revision of this Plan.

After final SERP approval, changes will be updated to the Document Control System. The Document Control supervisor will update this Plan and then amend all current copies of the Plan to the recipients listed on the Distribution List at the beginning of this document.

### **7.2 Training**

Semi-annual training for the emergency response teams will be conducted. This training will include, but not be limited to, fire suppression, emergency medical services, evacuation under hazardous atmosphere conditions, search and rescue, proper PPE usage during each potential emergency situation and radiological contamination surveying onsite and offsite.

Each member of the emergency response team will be assigned his or her tasks and trained in detail about those tasks. The Radiation Staff will be trained in the proper decontamination of personnel, PPE and potentially offsite medical facilities.

All employees onsite will be trained in the use of respiratory protection and on radiological hazards during their normal monthly safety meetings and as needed during special radiation training sessions as processes change at the facility.

Because appropriately trained Mill personnel will be in attendance at the Mill to accompany any offsite emergency response personnel, there is no need to provide periodic orientation tours of the facility to such personnel.

### **7.3 Drills and Exercises**

Quarterly drills, as required by MSHA, are conducted by the Safety and Radiation Departments to monitor performance of personnel responding to emergency situations. Each drill is enacted upon one or more of the potential emergencies contemplated by this Plan. The drill and evacuation activities are documented by the Mill's Safety Coordinator and maintained within plant files. Management reviews all drills at quarterly ALARA Committee Meetings.

Because the impacts associated with most types of emergencies that could occur at the Mill are limited to the Mill site itself, and the risks to the public are very low, offsite agencies are not typically invited to participate in any drills or exercises at the Mill.

### **7.3.1 Biennial Exercises**

Commencing in 2010, training exercises will be held every two years with the potential offsite emergency responders. These exercises consist of training and information pertaining to the operational activities at the time.

### **7.3.2 Quarterly Communications Checks**

Quarterly communication checks with all potential offsite emergency responders will be performed. The communication checks will be documented and housed in the Safety Department records. These checks will update any changes to contact information for needed parties.

Emergency response groups that are required to be contacted are:

- Blanding Police Department;
- Blanding City Fire Department;
- San Juan County Sheriff;
- San Juan County EMS;
- All local medical clinics and or hospitals; and
- Utah Highway Patrol

### **7.4 Critiques**

This Plan is subject to audit by the ALARA audit team (see Section 7.5 below), and the periodic drills and exercises referred to in Section 7.3 above are subject to review periodically by the Mill's ALARA Committee. Given the nature of the potential incidents that could occur at the Mill and the low risk to the public relative to incidents that could occur at other types of facilities, such as nuclear power reactors, the Mill does not require that a critique be prepared for each drill and exercise by one or more of the nonparticipating observers, other than the audits and reviews conducted by the ALARA Audit Committee and the ALARA Committee.

### **7.5 Independent Audit**

This Plan, including all procedures, training activities, emergency facilities, equipment, and supplies, and records associated with offsite support agency interface, described therein, is subject to annual review by the Mill's ALARA audit team. The Mill's ALARA audit team is comprised of DUSA corporate environmental and safety personnel who do not have direct responsibilities for implementing the emergency response program, as well as an independent outside consultant with expertise in environmental and radiation safety matters.

Any recommendations or deficiencies observed by the ALARA audit team will be presented to the ALARA Committee for consideration typically within approximately 60 days after the audit has been completed. Decisions by the Mill's ALARA Committee to make any changes to this Plan will be submitted to the Mill's SERP for implementation. Any changes in plant layout,

process or facilities are included in the types of changes that will be reviewed and could warrant revision to this Plan

#### **7.6 Maintenance and Inventory of Emergency Equipment, Instrumentation and Supplies**

Fire extinguishers, as well as the fire pump system, are inspected on an annual basis. The Mill Safety Coordinator performs regular spot checks on the emergency equipment locations to ensure that all of the equipment is in place. Extinguishers are serviced on an annual basis and then checked monthly to make sure units are still charged. The SCBA units are also checked monthly and then pressure tested every five years.

#### **7.7 Letters of Agreement**

Any changes to this Plan that would impact the actions of any offsite response organizations will be communicated to such organizations. The Mill will review all letters of agreement with offsite agencies periodically to ensure that they are kept up to date and in force.

## **8. RECORDS AND REPORTS**

### **8.1 Records of Incidents**

A written report will be prepared for all incidents of abnormal operation, equipment failure and accidents that led to a plant emergency that is classified as an Alert or Site Area Emergency.

The report will include the cause of the incident, personnel and equipment involved, extent of injury and damage (onsite and offsite) resulting from the incident, all locations of contamination with the final decontamination survey results, corrective actions taken to terminate the emergency, and the action taken or planned to prevent a recurrence of the incident. The report will also include the onsite and offsite support assistance requested and received, as well as any program changes resulting from the lessons learned from any critique of emergency response activities.

All such reports unique to a radiological emergency, not covered by existing regulations or License conditions will be retained until the License is terminated.

The foregoing reports will be prepared under the direction of the RSO, and will be maintained in the Mill's files for inspection.

### **8.2 Records of Preparedness Assurance**

Records will be maintained in accordance with all MSHA, State of Utah and ALARA criteria. These documents will be available on site and housed in the Safety Department for review.

## **9. RECOVERY AND PLANT RESTORATION**

The Incident Commander will make the determination as to when the facility has been restored to safe status. In making this determination, the Incident Commander will:

- i) Assess the damage to and the status of the facility's capabilities to control radioactive materials and hazardous materials. Specifically, the Incident Commander must be satisfied that all safety-related equipment required for safe occupation and use of the facility, in those areas to be occupied and used (e.g., radiation monitoring instruments, respiratory protection equipment, fire-suppression and fire-fighting equipment, containments, and air filters) have been checked and restored to normal operations. The Incident Commander will be assisted by the RSO, the Safety Coordinator and the Maintenance Supervisor or Maintenance Forman in making these determinations; and
- ii) Determine the actions necessary to reduce any ongoing releases of radioactive or other hazardous material and to prevent further incidents. The Incident Commander will be assisted by the RSO, the Safety Coordinator and the Maintenance Supervisor or Maintenance Forman in making these determinations.

The Incident Commander will direct the resources and personnel required in order to accomplish the tasks to meet any required restoration action. During any planned restoration operations, personnel exposures to radiation will be maintained within UAC R313-15 limits and as low as is reasonably achievable.

## **10. COMPLIANCE WITH COMMUNITY RIGHT-TO-KNOW ACT AND CLEAN AIR ACT**

### **10.1 Community Right to Know Act**

Section 11002 and 11004 of the Emergency Response and Community Right to Know Act ("EPCRA") of 1986; 42 U.S.C. 11001 et seq., requires that notice be given to the community emergency response coordinator for the local emergency planning committee in the event of a release of an extremely hazardous substance offsite. This requirement does not apply to any release which results in exposure to persons solely within the sites or sites within which the facility is located.

The Mill maintains inventories of two extremely hazardous substances: anhydrous ammonia and propane. Mill personnel are required to provide notice to the community response coordinator for the local emergency planning committee in the event of an offsite release of either of those two substances. See Sections 2.1.1, 2.1.2 and 2.1.3 above and Appendices A, B and C.

### **10.2 Clean Air Act**

When Congress passed the Clean Air Act Amendments of 1990, Section 112r required EPA to publish regulations and guidance for chemical accident prevention at facilities using substances that posed the greatest risk of harm from accidental releases. These regulations require facilities such as the Mill that use, store or otherwise handle a threshold quantity of certain listed regulated flammable and toxic substances to develop a Risk Management Program (known as a "Risk Management Plan").

The Mill uses, stores and handles threshold quantities of two substances listed under the regulations promulgated under Section 112r of the Clean Air Act: anhydrous ammonia and propane, and has submitted to EPA a Risk Management Plan for those two substances. A copy of that Risk Management Plan is attached as Appendix K to this Plan.

## APPENDIX A

### **EMERGENCY RESPONSE PROCEDURE FOR A RELEASE OF ANHYDROUS AMMONIA**

**(See also Section 2.1.1 of the Emergency Response Plan)**

The following steps will be followed for an uncontrolled release of anhydrous ammonia. The steps should be followed in the order set out below, unless more than one crew is mobilized, in which case some of the steps can be taken simultaneously by different crews. The Incident Commander has the authority to vary from the steps set out below if he deems it necessary in the circumstances to protect public health, safety or the environment.

**CAUTION: INHALATION OF ANYDROUS AMMONIA CAN CAUSE INCAPACITATION, SERIOUS INJURY AND DEATH.**

1. A release of anhydrous ammonia would most likely occur suddenly. The person who would first witness the release should immediately contact his or her supervisor who would activate the evacuation alarm by using the "dial 184" notification system.
2. Evacuate all personnel from the Mill site to a location upwind of the spill, and account for all personnel, including all contractors and visitors at the Mill and all ore, product and reagent truck drivers, in accordance with the Emergency Evacuation and Shutdown Procedure described in Appendix J.
3. Determine Incident Commander. The Incident Commander will be the Mill Manager, or in his absence the Mill Superintendent, or in the absence of both the Mill Manager and the Mill Superintendent, the RSO. Shift Foremen are in charge and are responsible for all emergency procedures until the Incident Commander arrives.
4. Determine crews that may be required (see Section 4.2.2 of the Plan for a discussion of the available crews at the disposal of the Incident Commander).
5. Mobilize trained personnel and emergency equipment such as SCBAs, first aid equipment etc. See U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration 2008 Emergency Response Guidebook (the "DOT Guidebook") for appropriate protective clothing. In that Guidebook, Anhydrous ammonia has an ID No. of 1005 and is covered by Guide No. 125. A copy of Guide 125 is attached to this Appendix.
6. Initiate rescue operations for any people who may be trapped by the release; do this only with properly trained and equipped personnel.

7. Attend to any injured persons:

- One of the following EMT-trained personnel should be contacted, if they are on-site to aid in the event of any injuries to personnel:
  - David Turk
- Move victim to fresh air;
- Give artificial respiration if victim is not breathing;
- **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device;**
- Administer oxygen if breathing is difficult;
- Remove and isolate contaminated clothing and shoes;
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes;
- Control any bleeding;
- Treat for shock, if necessary;
- Immobilize any fractures and stabilize for transportation;
- Scan the injured for excessive alpha prior to transporting if time allows
  - (If alpha is excessive or there is no time to scan, notify the clinic/hospital personnel and the RSO);
- Keep victim warm and quiet.
- Keep victim under observation. Effects of contact or inhalation may be delayed;
- The Safety Coordinator or a Safety Technician will notify the following as needed:
  - Blanding Clinic 678-2254 or 678-3434 (930 N. 400 W.)
  - San Juan Hospital, Monticello 678-2830 or 587-2116 (364 W. 1st N.)
  - Ambulance Service, Blanding Dial 911
- Ensure that medical personnel are aware of the materials involved and take precautions to protect themselves; and
- If the Mill ambulance is used, an attendant must ride with the injured person in addition to the driver, except where the injured person could normally be transported in a car or pickup.

8. Initiate necessary steps to contain and/or neutralize the release, such as spraying with water fog, turning off valves, etc.

- See Material Safety Data Sheet attached to this Appendix; and
- See Exhibit 7 for a list and locations of main shut-off valves.

9. Guard against possible fires by shutting off electrical circuits, isolating gas lines and eliminating ignition sources from affected areas.

10. If the incident involves an uncontrolled release of 100 pounds (20 gallons) or more of anhydrous ammonia, the incident is classified as a Site Area Emergency and could pose a





- Report to MSHA

Any release of anhydrous ammonia at the Mill facility in excess of 7 gallons (35 pounds) or that otherwise has a reasonable potential to cause death to an individual must be reported within 15 minutes to MSHA at-1-800-746-1553.

#### 17. Written Reports

The RSO will prepare a written report of the incident for Mill files, containing the information set out in Section 8.1 of the Plan.

**ID Guide Name of Material**  
**No. No.**

— 112 Ammonium nitrate-fuel oil mixtures  
 — 158 Biological agents  
 — 112 Blasting agent, n.o.s.  
 — 112 Explosive A  
 — 112 Explosive B  
 — 114 Explosive C  
 — 112 Explosives, division 1.1, 1.2, 1.3, 1.5 or 1.6  
 — 114 Explosives, division 1.4  
 — 153 Toxins  
 1001 116 Acetylene  
 1001 116 Acetylene, dissolved  
 1002 122 Air, compressed  
 1003 122 Air, refrigerated liquid (cryogenic liquid)  
 1003 122 Air, refrigerated liquid (cryogenic liquid), non-pressurized  
 1005 125 Ammonia, anhydrous  
 1005 125 Anhydrous ammonia  
 1006 121 Argon  
 1006 121 Argon, compressed  
 1008 125 Boron trifluoride  
 1008 125 Boron trifluoride, compressed  
 1009 126 Bromotrifluoromethane  
 1009 126 Refrigerant gas R-13B1  
 1010 116P Butadienes, stabilized  
 1010 116P Butadienes and hydrocarbon mixture, stabilized  
 1011 115 Butane  
 1011 115 Butane mixture  
 1012 115 Butylene  
 1013 120 Carbon dioxide

**ID Guide Name of Material**  
**No. No.**

1013 120 Carbon dioxide, compressed  
 1014 122 Carbon dioxide and Oxygen mixture  
 1014 122 Carbon dioxide and Oxygen mixture, compressed  
 1014 122 Oxygen and Carbon dioxide mixture  
 1014 122 Oxygen and Carbon dioxide mixture, compressed  
 1015 126 Carbon dioxide and Nitrous oxide mixture  
 1015 126 Nitrous oxide and Carbon dioxide mixture  
 1016 119 Carbon monoxide  
 1016 119 Carbon monoxide, compressed  
 1017 124 Chlorine  
 1018 126 Chlorodifluoromethane  
 1018 126 Refrigerant gas R-22  
 1020 126 Chloropentafluoroethane  
 1020 126 Refrigerant gas R-115  
 1021 126 1-Chloro-1,2,2,2-tetrafluoroethane  
 1021 126 Chlorotetrafluoroethane  
 1021 126 Refrigerant gas R-124  
 1022 126 Chlorotrifluoromethane  
 1022 126 Refrigerant gas R-13  
 1023 119 Coal gas  
 1023 119 Coal gas, compressed  
 1026 119 Cyanogen  
 1026 119 Cyanogen gas  
 1027 115 Cyclopropane  
 1028 126 Dichlorodifluoromethane  
 1028 126 Refrigerant gas R-12  
 1029 126 Dichlorofluoromethane  
 1029 126 Refrigerant gas R-21

**POTENTIAL HAZARDS****HEALTH**

- **TOXIC; may be fatal if inhaled, ingested or absorbed through skin.**
- Vapors are extremely irritating and corrosive.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

**FIRE OR EXPLOSION**

- Some may burn but none ignite readily.
- Vapors from liquefied gas are initially heavier than air and spread along ground.
- Some of these materials may react violently with water.
- Cylinders exposed to fire may vent and release toxic and/or corrosive gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

**PUBLIC SAFETY**

- **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Keep out of low areas.
- Ventilate closed spaces before entering.

**PROTECTIVE CLOTHING**

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations **ONLY**; it is not effective in spill situations where direct contact with the substance is possible.

**EVACUATION****Spill**

- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under "PUBLIC SAFETY".

**Fire**

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

**EMERGENCY RESPONSE****FIRE****Small Fire**

- Dry chemical or CO<sub>2</sub>.

**Large Fire**

- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.
- Do not get water inside containers.
- Damaged cylinders should be handled only by specialists.

**Fire involving Tanks**

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • ALWAYS stay away from tanks engulfed in fire.

**SPILL OR LEAK**

- Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Do not direct water at spill or source of leak.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. • Isolate area until gas has dispersed.

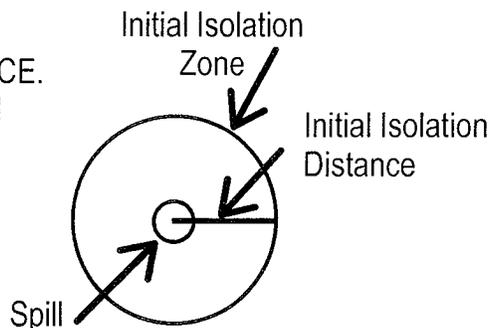
**FIRST AID**

- Move victim to fresh air. • Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.**
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- **In case of contact with Hydrogen fluoride, anhydrous (UN1052), flush skin and eyes with water for 5 minutes; then, for skin exposures rub on a calcium/jelly combination; for eyes flush with a water/calcium solution for 15 minutes.**
- Keep victim warm and quiet. • Keep victim under observation.
- Effects of contact or inhalation may be delayed.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

## HOW TO USE TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

- (1) The responder should already have:
  - Identified the material by its ID Number and Name; (if an ID Number cannot be found, use the Name of Material index in the blue-bordered pages to locate that number.)
  - Found the three-digit guide for that material in order to consult the emergency actions recommended jointly with this table;
  - **Noted the wind direction.**
- (2) Look in Table 1 (the green-bordered pages) for the ID Number and Name of the Material involved in the incident. Some ID Numbers have more than one shipping name listed—look for the specific name of the material. (If the shipping name is not known and Table 1 lists more than one name for the same ID Number, use the entry with the largest protective action distances.)
- (3) Determine if the incident involves a SMALL or LARGE spill and if DAY or NIGHT. Generally, a SMALL SPILL is one which involves a single, small package (e.g., a drum containing up to approximately 200 liters), a small cylinder, or a small leak from a large package. A LARGE SPILL is one which involves a spill from a large package, or multiple spills from many small packages. DAY is any time after sunrise and before sunset. NIGHT is any time between sunset and sunrise.

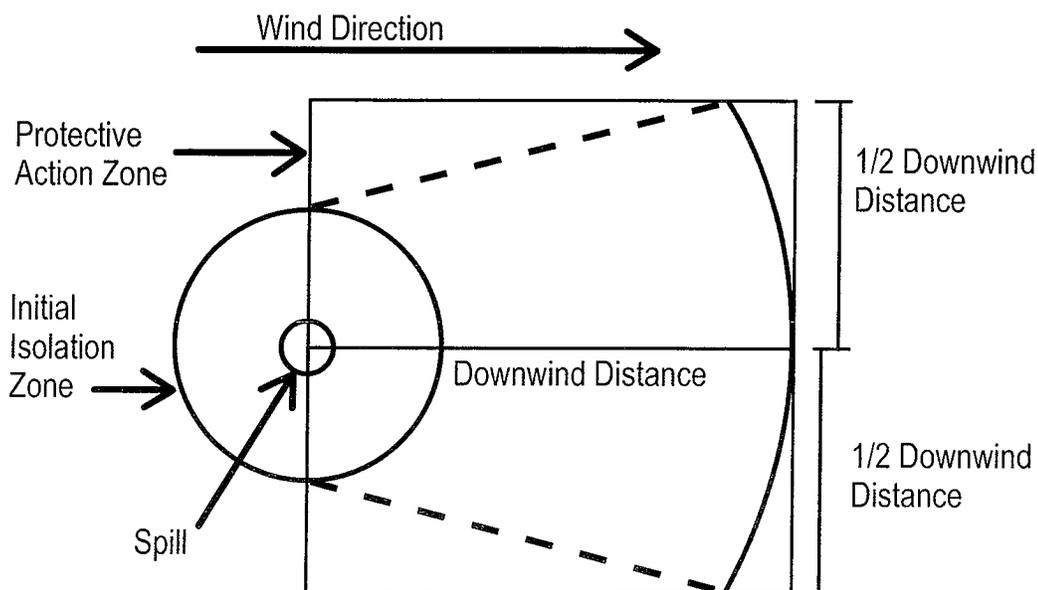
- (4) Look up the INITIAL ISOLATION DISTANCE. Direct all persons to move, in a crosswind direction, away from the spill to the distance specified—in meters and feet.



- (5) Look up the initial PROTECTIVE ACTION DISTANCE shown in Table 1. For a given material, spill size, and whether day or night, Table 1 gives the downwind distance—in kilometers and miles—for which protective actions should be considered. For practical purposes, the Protective Action Zone (i.e., the area in which people are at risk of harmful exposure) is a square, whose length and width are the same as the downwind distance shown in Table 1.

- (6) Initiate Protective Actions to the extent possible, beginning with those closest to the spill site and working away from the site in the downwind direction. When a water-reactive TIH producing material is spilled into a river or stream, the source of the toxic gas may move with the current or stretch from the spill point downstream for a substantial distance.

The shape of the area in which protective actions should be taken (the Protective Action Zone) is shown in this figure. The spill is located at the center of the small circle. The larger circle represents the INITIAL ISOLATION zone around the spill.



**NOTE 1:** See "Introduction To Table 1 - Initial Isolation And Protective Action Distances" for factors which may increase or decrease Protective Action Distances.

**NOTE 2:** See Table 2 – Water-Reactive Materials which Produce Toxic Gases for the list of gases produced when these materials are spilled in water.

Call the emergency response telephone number listed on the shipping paper, or the appropriate response agency as soon as possible for additional information on the material, safety precautions, and mitigation procedures.

**TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES**

ID No.	NAME OF MATERIAL	SMALL SPILLS (From a small package or small leak from a large package)				LARGE SPILLS (From a large package or from many small packages)			
		ISOLATE in all Directions		PROTECT persons Downwind during-		ISOLATE in all Directions		PROTECT persons Downwind during-	
		Meters (Feet)	Kilometers (Miles)	DAY Kilometers (Miles)	NIGHT Kilometers (Miles)	Meters (Feet)	Kilometers (Miles)	DAY Kilometers (Miles)	NIGHT Kilometers (Miles)
1005 1005	Ammonia, anhydrous Anhydrous ammonia	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	0.2 km (0.1 mi)	150 m (500 ft)	0.8 km (0.5 mi)	2.3 km (1.4 mi)	
1008 1008	Boron trifluoride Boron trifluoride, compressed	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	0.6 km (0.4 mi)	300 m (1000 ft)	1.9 km (1.2 mi)	4.8 km (3.0 mi)	
1016 1016	Carbon monoxide Carbon monoxide, compressed	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	150 m (500 ft)	0.7 km (0.5 mi)	2.7 km (1.7 mi)	
1017	Chlorine	60 m (200 ft)	0.4 km (0.3 mi)	1.6 km (1.0 mi)		600 m (2000 ft)	3.5 km (2.2 mi)	8.0 km (5.0 mi)	
1023 1023	Coal gas Coal gas, compressed	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	60 m (200 ft)	0.3 km (0.2 mi)	0.4 km (0.3 mi)	
1026 1026	Cyanogen Cyanogen gas	30 m (100 ft)	0.2 km (0.1 mi)	0.9 km (0.5 mi)		150 m (500 ft)	1.0 km (0.7 mi)	3.5 km (2.2 mi)	
1040 1040	Ethylene oxide Ethylene oxide with Nitrogen	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.1 mi)		150 m (500 ft)	0.8 km (0.5 mi)	2.5 km (1.6 mi)	
1045 1045	Fluorine Fluorine, compressed	30 m (100 ft)	0.1 km (0.1 mi)	0.3 km (0.2 mi)		150 m (500 ft)	0.8 km (0.5 mi)	3.1 km (1.9 mi)	
1048	Hydrogen bromide, anhydrous	30 m (100 ft)	0.1 km (0.1 mi)	0.4 km (0.3 mi)		300 m (1000 ft)	1.5 km (1.0 mi)	4.5 km (2.8 mi)	
1050	Hydrogen chloride, anhydrous	30 m (100 ft)	0.1 km (0.1 mi)	0.4 km (0.2 mi)		60 m (200 ft)	0.3 km (0.2 mi)	1.4 km (0.9 mi)	
1051	AC (when used as a weapon)	100 m (300 ft)	0.3 km (0.2 mi)	1.1 km (0.7 mi)		1000 m (3000 ft)	3.8 km (2.4 mi)	7.2 km (4.5 mi)	
1051	Hydrocyanic acid, aqueous solutions, with more than 20% Hydrogen cyanide	60 m (200 ft)	0.2 km (0.1 mi)	0.6 km (0.4 mi)		400 m (1250 ft)	1.6 km (1.0 mi)	4.1 km (2.5 mi)	
1051 1051	Hydrogen cyanide, anhydrous, stabilized Hydrogen cyanide, stabilized								
1052	Hydrogen fluoride, anhydrous	30 m (100 ft)	0.1 km (0.1 mi)	0.5 km (0.3 mi)		300 m (1000 ft)	1.7 km (1.1 mi)	3.6 km (2.2 mi)	

## PROTECTIVE CLOTHING

**Street Clothing and Work Uniforms.** These garments, such as uniforms worn by police and emergency medical services personnel, provide almost no protection from the harmful effects of dangerous goods.

**Structural Fire Fighters' Protective Clothing (SFPC).** This category of clothing, often called turnout or bunker gear, means the protective clothing normally worn by fire fighters during structural fire fighting operations. It includes a helmet, coat, pants, boots, gloves and a hood to cover parts of the head not protected by the helmet and facepiece. This clothing must be used with full-facepiece positive pressure self-contained breathing apparatus (SCBA). This protective clothing should, at a minimum, meet the OSHA Fire Brigades Standard (29 CFR 1910.156). Structural fire fighters' protective clothing provides limited protection from heat and cold, but may not provide adequate protection from the harmful vapors or liquids that are encountered during dangerous goods incidents. Each guide includes a statement about the use of SFPC in incidents involving those materials referenced by that guide. Some guides state that SFPC provides limited protection. In those cases, the responder wearing SFPC and SCBA may be able to perform an expedient, that is quick "in-and-out", operation. However, this type of operation can place the responder at risk of exposure, injury or death. The incident commander makes the decision to perform this operation only if an overriding benefit can be gained (i.e., perform an immediate rescue, turn off a valve to control a leak, etc.). The coverall-type protective clothing customarily worn to fight fires in forests or wildlands is **not** SFPC and is not recommended nor referred to elsewhere in this guidebook.

**Positive Pressure Self-Contained Breathing Apparatus (SCBA).** This apparatus provides a constant, positive pressure flow of air within the facepiece, even if one inhales deeply while doing heavy work. Use apparatus certified by NIOSH and the Department of Labor/Mine Safety and Health Administration in accordance with 42 CFR Part 84. Use it in accordance with the requirements for respiratory protection specified in OSHA 29 CFR 1910.134 (Respiratory Protection) and/or 29 CFR 1910.156 (f) (Fire Brigades Standard). Chemical-cartridge respirators or other filtering masks are not acceptable substitutes for positive pressure self-contained breathing apparatus. Demand-type SCBA does not meet the OSHA 29 CFR 1910.156 (f)(1)(i) of the Fire Brigades Standard. If it is suspected that a Chemical Warfare Agent (CW) is involved, the use of NIOSH-certified respirators with CBRN protection are highly recommended.

**Chemical Protective Clothing and Equipment.** Safe use of this type of protective clothing and equipment requires specific skills developed through training and experience. It is generally not available to, or used by, first responders. This type of special clothing may protect against one chemical, yet be readily permeated by chemicals for which it was not designed. Therefore, protective clothing should not be used unless it is compatible with the released material. This type of special clothing offers little or no protection against heat and/or cold. Examples of this type of equipment have been described as (1) Vapor Protective

Suits (NFPA 1991), also known as Totally-Encapsulating Chemical Protective (TECP) Suits or Level A\* protection (OSHA 29 CFR 1910.120, Appendix A & B), and (2) Liquid-Splash Protective Suits (NFPA 1992 & 1993), also known as Level B\* or C\* protection (OSHA 29 CFR 1910.120, Appendix A & B) or suits for chemical/biological terrorism incidents (NFPA 1994), class 1, 2 or 3 Ensembles. No single protective clothing material will protect you from all dangerous goods. Do not assume any protective clothing is resistant to cold and/or heat or flame exposure unless it is so certified by the manufacturer. (NFPA 1991 5-3 Flammability Resistance Test and 5-6 Cold Temperature Performance Test)

\* Consult glossary for additional protection levels under the heading "Protective Clothing".

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 001

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

*MASTER*

ORDER NO: 325997  
PROD NO : 744672

INTL. URANIUM (USA) CORP.  
6425 SO. HYW. 191

BLANDING , UT 84511

UNIVAR USA INC.  
6100 CARILLON POINT , KIRKLAND

(425)889-3400  
, WA 98033

----- EMERGENCY ASSISTANCE -----

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL - CHEMTREC  
(800)424-9300

PRODUCT NAME: ANHYDROUS AMMONIA  
SDS NUMBER: P1043VS  
DATE ISSUED: 09/21/2002  
SUPERSEDES: 12/10/1999  
ISSUED BY: 005350

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MATERIAL SAFETY DATA SHEET

OSHA HAZARD RATING  
HEALTH: 3  
FLAMMABILITY: 1  
REACTIVITY: 0  
OTHER:

PART I WHAT IS THE MATERIAL AND WHAT DO I NEED TO KNOW IN AN EMERGENCY?

PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: ANHYDROUS AMMONIA

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 002

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

PRODUCT USE: FOR GENERAL ANALYTICAL/SYNTHETIC CHEMICAL USES.

DISTRIBUTOR:  
UNIVAR USA  
6100 CARILLON POINT  
KIRKLAND, WA 98033  
425-889-3400

2. COMPOSITION AND INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	MOLE %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
			TWA	STEL	TWA	STEL	IDLH	
PPM			PPM	PPM	PPM	PPM	PPM	PPM
AMMONIA	7664-41-7	99%	25	35	NE	35	300	NIOSH RELS: TWA = 25 STEL = 35 DFG MAKs: TWA = 20 PEAK = 2 MAK 15 MINUTES, AVERAGE VALUE DFG MAK PREGNANCY RISK CLASSIFICATION: C

MAXIMUM IMPURITIES < 1% NONE OF THE TRACE IMPURITIES OF THIS GAS CONTRIBUTE SIGNIFICANTLY TO THE HAZARDS ASSOCIATED WITH THE PRODUCT. ALL HAZARD INFORMATION PERTINENT TO THIS PRODUCT HAS BEEN PROVIDED IN THIS MATERIAL SAFETY DATA SHEET, PER THE REQUIREMENTS OF THE FEDERAL OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION STANDARD (29 CFR 1910.1200), U.S. STATE EQUIVALENT STANDARDS AND CANADIAN WORKPLACE HAZARDOUS MATERIALS IDENTIFICATION SYSTEM STANDARDS (CPR 4).

E = NOT ESTABLISHED.

SEE SECTION 16 FOR DEFINITIONS OF TERMS USED.

NOTE (1): ALL WHMIS REQUIRED INFORMATION IS INCLUDED IN APPROPRIATE SECTIONS BASED ON THE ANSI Z400.1-1998 FORMAT. THIS GAS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CPR AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

7. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: AMMONIA IS A PUNGENT-SMELLING, TOXIC, CORROSIVE, NON-FLAMMABLE GAS HAVING A SUFFOCATING ODOR. AMMONIA IS SHIPPED BOTH AS A GAS AND LIQUEFIED GAS UNDER ITS OWN VAPOR PRESSURE. THE GAS CAN BURN AND DAMAGE EYES, SKIN, MUCOUS MEMBRANES, AND ANY OTHER EXPOSED TISSUE. INHALATION CAN CAUSE COUGHING AND BREATHING DIFFICULTY. OVEREXPOSURE TO THIS GAS MAY BE FATAL. CONTACT WITH RAPIDLY EXPANDING GASES, OR CONTACT WITH THE LIQUID, MAY

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

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CAUSE FROSTBITE. THIS GAS IS LIGHTER THAN AIR AND CAN ACCUMULATE IN HIGH SPACES. (CONTINUED ON FOLLOWING PAGE)

ALTHOUGH LABELED AS A NON-FLAMMABLE GAS, IT CAN BURN. AMMONIA IS NOT READILY IGNITED, BUT EXPLOSIONS OF AMMONIA IN CONFINED SPACES HAVE BEEN REPORTED. VAPOR CLOUDS OF THE GAS MAY BE CONTROLLED USING A WATER FOG. IF INVOLVED IN A FIRE, AMMONIA CAN DECOMPOSE, FORMING VERY FLAMMABLE HYDROGEN AND TOXIC NITROGEN DIOXIDE. PERSONS WHO RESPOND TO RELEASES OF AMMONIA MUST PROTECT THEMSELVES FROM INHALATION OF THE AMMONIA GASES AND MISTS, ESPECIALLY IN AREAS WHICH ARE DOWNWIND OF THE RELEASE. EXTREME CAUTION MUST BE USED WHEN RESPONDING TO RELEASES.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE:

THE MOST SIGNIFICANT ROUTE OF OVEREXPOSURE FOR THIS GAS IS BY INHALATION. THE FOLLOWING PARAGRAPHS DESCRIBE SYMPTOMS OF EXPOSURE BY ROUTE OF EXPOSURE.

INHALATION: INHALATION OF AMMONIA VAPORS MAY LEAD TO IRRITATION OF THE NOSE AND THROAT. EXPOSURES TO HIGH CONCENTRATIONS OF AMMONIA GAS CAN LEAD TO SYMPTOMS SUCH AS COUGHING, LABORED BREATHING, SORE THROAT, AND IN SOME INSTANCES, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA. HIGH CONCENTRATIONS OF AMMONIA GAS MAY CAUSE AN OXYGEN DEFICIENT ATMOSPHERE. EXPOSURE TO HIGH CONCENTRATIONS MAY CAUSE UNCONSCIOUSNESS, AND UNDER SOME CIRCUMSTANCES, DEATH. EXPOSURE TO THE EYES MAY CAUSE TEMPORARY BLINDNESS, LEADING TO PERMANENT VISION IMPAIRMENT.

## HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH HAZARD (BLUE) = 3  
 FLAMMABILITY HAZARD (RED) = 1  
 PHYSICAL HAZARD (YELLOW) = 0  
 PROTECTIVE EQUIPMENT = H

RESPIRATORY AND BODY: SEE SECTION 8  
 FOR ROUTINE INDUSTRIAL USE AND HANDLING APPLICATIONS

REPEATED AMMONIA OVEREXPOSURES BY INHALATION CAN RESULT IN EMPHYSEMA. THE SYMPTOMS ASSOCIATED WITH SPECIFIC AMMONIA CONCENTRATIONS ARE AS FOLLOWS:

CONCENTRATION	SYMPTOM(S)
.6 - 53 PPM	ODOR THRESHOLD.
25 - 50 PPM	IRRITATION OF THE EYES AND MUCOUS MEMBRANES, WHICH CAN BE TOLERATED FOR SEVERAL HOURS.
100 - 150 PPM	IMMEDIATE IRRITATION OF THE THROAT, WHICH MAY BE TOLERATED FOR AN HOUR.
400 - 700 PPM	IMMEDIATE, SEVERE IRRITATION OF THE RESPIRATORY SYSTEM AND EYES OCCURS.
1000 PPM	THIS LEVEL OF EXPOSURE MAY RESULT IN RAPID DEATH DUE TO SUFFOCATION OR FLUID IN THE LUNGS. EXPOSURE TO CONCENTRATIONS IN EXCESS OF 5000 PPM MAY CAUSE

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 004

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

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LARYNGEAL SPASMS, RESULTING IN DEATH.  
CONTACT WITH LIQUID AMMONIA MAY CAUSE IMMEDIATE, SEVERE CHEMICAL BURNS AS WELL AS FROSTBITE, AND ALL OF THE SYMPTOMS DESCRIBED FOR OVEREXPOSURE TO THE GAS.

CONTACT WITH SKIN OR EYES: CONTACT OF THE LIQUID (OR GASEOUS PRODUCT OR THE MIST PRODUCED BY AMMONIA), WITH THE SKIN CAN LEAD TO SEVERE BURNS OR DERMATITIS (RED, CRACKED, IRRITATED SKIN), DEPENDING UPON CONCENTRATION AND DURATION OF EXPOSURE. HIGH LEVELS OF AIRBORNE AMMONIA GAS DISSOLVE IN MOISTURE ON THE SKIN, FORMING CORROSIVE AMMONIUM HYDROXIDE. AT 10,000 PPM, AMMONIA IS MILDLY IRRITATING TO MOIST SKIN. AT 20,000 PPM, THE EFFECTS ARE MORE PRONOUNCED AND 30000 PPM MAY PRODUCE CHEMICAL BURNS WITH BLISTERING. CONTACT OF THE LIQUID (OR GASEOUS PRODUCT OR THE MIST PRODUCED BY AMMONIA), WITH THE EYES CAN CAUSE PAIN, REDNESS, AND PROLONGED EXPOSURE COULD CAUSE BLINDNESS. CONTACT WITH THE UNDILUTED LIQUID WILL CAUSE FROSTBITE, ULCERATION OF THE SKIN (WHICH MAY BE DELAYED IN APPEARANCE FOR SEVERAL HOURS), BLISTERING, AND PAIN.

OTHER POTENTIAL HEALTH EFFECTS: WHILE INGESTION IS HIGHLY UNLIKELY, INGESTION OF AMMONIA CAN DAMAGE THE TISSUES OF THE MOUTH, THROAT, ESOPHAGUS, AND OTHER TISSUES OF THE DIGESTIVE SYSTEM. INGESTION OF AMMONIA CAN BE FATAL. ADDITIONALLY, ASPIRATION BY INHALATION IS POSSIBLE, CAUSING CHEMICAL PNEUMONIA OR DEATH. CONTACT WITH LIQUID AMMONIA OR RAPIDLY EXPANDING GASES (WHICH ARE RELEASED UNDER HIGH PRESSURE) MAY CAUSE FROSTBITE. SYMPTOMS OF FROSTBITE INCLUDE CHANGE IN SKIN COLOR TO WHITE OR GRAYISH-YELLOW. THE PAIN AFTER CONTACT WITH RAPIDLY EXPANDING GASES CAN QUICKLY SUBSIDE.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: AN EXPLANATION IN LAY TERMS. OVEREXPOSURE TO AMMONIA MAY CAUSE THE FOLLOWING HEALTH EFFECTS:  
ACUTE: THIS GAS IS EXTREMELY CORROSIVE, AND CAN BURN AND DAMAGE EYES, SKIN, MUCOUS MEMBRANES, AND ANY OTHER EXPOSED TISSUE. IF INHALED, IRRITATION OF THE RESPIRATORY SYSTEM MAY OCCUR, WITH COUGHING, AND BREATHING DIFFICULTY. OVEREXPOSURE TO THIS GAS MAY BE FATAL. THOUGH UNLIKELY TO OCCUR DURING OCCUPATIONAL USE, INGESTION OF LARGE QUANTITIES MAY BE FATAL.

CHRONIC: PERSISTENT IRRITATION MAY RESULT FROM REPEATED EXPOSURES TO THIS GAS. REPEATED AMMONIA OVEREXPOSURES BY INHALATION CAN RESULT IN EMPHYSEMA. SEE SECTION 11 (TOXICOLOGICAL INFORMATION) FOR ADDITIONAL INFORMATION.

TARGET ORGANS: ACUTE: RESPIRATORY SYSTEM, SKIN, EYES.

CHRONIC: SKIN, RESPIRATORY SYSTEM.

PART II WHAT SHOULD I DO IF A HAZARDOUS SITUATION OCCURS?

FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO AMMONIA

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 005

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

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WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. AT A MINIMUM, SELF-CONTAINED BREATHING APPARATUS PERSONAL PROTECTIVE EQUIPMENT SHOULD BE WORN. IF NECESSARY, FIRE PROTECTION SHOULD BE PROVIDED. REMOVE VICTIM(S) TO A SAFE LOCATION. TRAINED PERSONNEL SHOULD ADMINISTER SUPPLEMENTAL OXYGEN AND/OR CARDIO-PULMONARY RESUSCITATION, IF NECESSARY. VICTIM(S) MUST BE TAKEN FOR MEDICAL ATTENTION. RESCUERS SHOULD BE TAKEN FOR MEDICAL ATTENTION, IF NECESSARY. TAKE COPY OF LABEL AND MSDS TO PHYSICIAN OR OTHER HEALTH PROFESSIONAL WITH VICTIM(S). REFER TO "RECOMMENDATIONS TO PHYSICIANS," BELOW FOR ADDITIONAL INFORMATION ON FIRST-AID MEASURES.

IN CASE OF FROSTBITE, PLACE THE FROSTBITTEN PART IN WARM WATER. DO NOT USE HOT WATER. IF WARM WATER IS NOT AVAILABLE, OR IS IMPRACTICAL TO USE, WRAP THE AFFECTED PARTS GENTLY IN BLANKETS. ALTERNATIVELY, IF THE FINGERS OR HANDS ARE FROSTBITTEN, PLACE THE AFFECTED AREA OF THE BODY IN THE ARMPIT. ENCOURAGE VICTIM TO GENTLY EXERCISE THE AFFECTED PART WHILE BEING WARMED. SEEK IMMEDIATE MEDICAL ATTENTION.

SKIN EXPOSURE: IF AMMONIA CONTAMINATES THE SKIN, IMMEDIATELY BEGIN DECONTAMINATION WITH RUNNING WATER. MINIMUM FLUSHING IS FOR 15 MINUTES. REMOVE EXPOSED OR CONTAMINATED CLOTHING, TAKING CARE NOT TO CONTAMINATE EYES. VICTIM MUST SEEK IMMEDIATE MEDICAL ATTENTION. SEEK IMMEDIATE MEDICAL ATTENTION.

EYE EXPOSURE: IF LIQUID IS SPLASHED INTO EYES, OR IF IRRITATION OF THE EYE DEVELOPS AFTER EXPOSURE TO LIQUID OR GAS, OPEN VICTIM'S EYES WHILE UNDER GENTLE RUNNING WATER. USE SUFFICIENT FORCE TO OPEN EYELIDS. HAVE VICTIM "ROLL" EYES. MINIMUM FLUSHING IS FOR 15 MINUTES.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: CONDITIONS RELATING TO THE TARGET ORGANS MAY BE AGGRAVATED BY OVEREXPOSURES TO AMMONIA. SEE SECTION 3 (HAZARD IDENTIFICATION) FOR INFORMATION ON THESE CONDITIONS.

RECOMMENDATIONS TO PHYSICIANS: TREAT SYMPTOMS, ADMINISTER LUNG FUNCTION TESTS AND POSSIBLE CHEST X-RAYS. REDUCE OVEREXPOSURE. DELAYED PULMONARY EDEMA MAY OCCUR, FOLLOWING OVEREXPOSURE BY INHALATION. BASIC TREATMENT: ESTABLISH A PATENT AIRWAY. SUCTION IF NECESSARY. WATCH FOR SIGNS OF RESPIRATORY INSUFFICIENCY AND ASSIST VENTILATIONS IF NECESSARY. ADMINISTER OXYGEN BY NON-REBREATHING MASK AT 10 TO 15 L/MINUTES. MONITOR FOR SIGNS OF PULMONARY EDEMA AND TREAT IF NECESSARY. MONITOR FOR SHOCK AND TREAT IF NECESSARY. FOR EYE CONTAMINATION, FLUSH EYES IMMEDIATELY WITH WATER. IRRIGATE EACH EYE CONTINUOUSLY WITH NORMAL SALINE DURING TRANSPORT. DO NOT USE EMETICS. FOR INGESTION, RINSE MOUTH AND ADMINISTER 5 ML/KG UP TO 200 ML OF WATER FOR DILUTION IF THE PATIENT CAN SWALLOW, HAS A STRONG GAG REFLEX, AND DOES NOT VOMIT. DO NOT ATTEMPT TO NEUTRALIZE.

#### FIRE-FIGHTING MEASURES

FLASH POINT: NO FLASH POINT DETERMINED IN CONVENTIONAL CLOSED CUP TESTS.

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 006

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

AMMONIA CAN BE IGNITED.

NFPA

HEALTH: 3

FLAMMABILITY: 1

REACTIVITY: 0

OTHER:

SEE SECTION 16 FOR DEFINITION OF RATINGS

AUTOIGNITION TEMPERATURE: 651 DEG C (1204 DEG F)

MINIMUM IGNITION ENERGY: 680 MILLIJOULES

FLAMMABLE LIMITS (IN AIR BY VOLUME, %):

LOWER (LEL): 15.0%

UPPER (UEL): 28.0%

FIRE EXTINGUISHING MATERIALS:

WATER SPRAY: YES CARBON DIOXIDE: YES

HALON: YES FOAM: YES

DRY CHEMICAL: YES OTHER: ANY "ABC" CLASS.

USUAL FIRE AND EXPLOSION HAZARDS: AMMONIA IS A TOXIC, CORROSIVE GAS AND PRESENTS AN EXTREME HAZARD TO FIREFIGHTERS. IN THE EVENT OF FIRE, COOL CONTAINERS OF AMMONIA WITH WATER TO PREVENT FAILURE.

USE A WATER SPRAY OR FOG TO REDUCE OR DIRECT VAPORS. DO NOT DIRECT A WATER SPRAY AT THE SOURCE OF A RELEASE. THIS GAS MAY IGNITE EXPLOSIVELY, IF RELEASED NEAR AN ACTIVE FIRE. AMMONIA IS LIGHTER THAN AIR, BUT CONDITIONS ASSOCIATED WITH A RELEASE CAN CAUSE IT TO ACCUMULATE IN LOW-LYING AREAS. THE EXPLOSIVE RANGE IS BROADENED TO 15 TO 79% BY MIXING WITH COMBUSTIBLE OR FLAMMABLE GASES (SUCH AS HYDROGEN), AND BY HIGHER TEMPERATURES AND PRESSURES. THE PRESENCE OF OIL OR COMBUSTIBLE MATERIALS INCREASES THE FIRE HAZARD AND THE PRESENCE OF IRON LOWERS THE IGNITION TEMPERATURE FROM 850- 651 DEG C (1652-1203.8 DEG F). AMMONIA DECOMPOSES INTO FLAMMABLE HYDROGEN GAS AT ABOUT 450-500 DEG C (842-932 DEG F). TOXIC AND IRRITATING NITROGEN DIOXIDE CAN FORM DURING BURNING IN AIR. CONTAINERS OR CYLINDERS MAY RUPTURE VIOLENTLY DUE TO OVER-PRESSURIZATION, IF EXPOSED TO FIRE OR EXCESSIVE HEAT FOR A SUFFICIENT PERIOD OF TIME, RELEASING FLAMMABLE AND TOXIC GASES.

EXPLOSION SENSITIVITY TO MECHANICAL IMPACT: NOT SENSITIVE.

EXPLOSION SENSITIVITY TO STATIC DISCHARGE: THERE IS INSUFFICIENT INFORMATION TO CLASSIFY AMMONIA GAS AS TO ITS SENSITIVITY TO STATIC DISCHARGE. LIQUEFIED AMMONIA WILL NOT ACCUMULATE STATIC CHARGE, SINCE THE ELECTRICAL CONDUCTIVITY IS HIGH.

SPECIAL FIRE-FIGHTING PROCEDURES: INCIPIENT FIRE RESPONDERS SHOULD WEAR EYE PROTECTION. STRUCTURAL FIREFIGHTERS MUST WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE EQUIPMENT. MOVE FIRE-EXPOSED CYLINDERS IF IT CAN BE DONE WITHOUT RISK TO FIREFIGHTERS. OTHERWISE, COOL CONTAINERS WITH

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 007

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

HOSE STREAM AND PROTECT PERSONNEL. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUNDS FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF TANKS DUE TO THE FIRE. IF AMMONIA IS INVOLVED IN A FIRE, FIRE RUNOFF WATER SHOULD BE CONTAINED TO PREVENT POSSIBLE ENVIRONMENTAL DAMAGE.

## 6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: UNCONTROLLED RELEASES SHOULD BE RESPONDED TO BY TRAINED PERSONNEL USING PRE-PLANNED PROCEDURES. PROPER PROTECTIVE EQUIPMENT SHOULD BE USED. IN CASE OF A LARGE RELEASE, CLEAR THE AFFECTED AREA, PROTECT PEOPLE, AND RESPOND WITH TRAINED PERSONNEL. IF POSSIBLE STOP THE GAS FLOW AT THE SOURCE. A WATER FOG OR MIST CAN BE USED TO CONTROL THE VAPOR CLOUD RESULTING FROM THE RELEASE. ELIMINATE SOURCES OF IGNITION. SUPPLY MAXIMUM POSSIBLE VENTILATION WITH EXPLOSION-PROOF EQUIPMENT. MINIMUM PERSONAL PROTECTIVE EQUIPMENT SHOULD BE LEVEL A: TRIPLE-GLOVES (NEOPRENE RUBBER GLOVES AND NITRILE GLOVES, OVER LATEX OR N-DEX GLOVES), FULLY-ENCAPSULATING CHEMICAL RESISTANT SUIT AND BOOTS, HARD-HAT, AND SELF CONTAINED BREATHING APPARATUS. LARGE RELEASES OF AMMONIA WILL BE EVIDENT BY THE CLOUD OF AMMONIA HYDROXIDE MIST WHICH IS FORMED. SMALL RELEASES OF AMMONIA CAN BE DETECTED BY MEANS OF AN ATOMIZER OR SQUEEZE BOTTLE FILLED WITH CONCENTRATED HYDROCHLORIC ACID, WHERE A WHITE CLOUD WILL SHOW THE LOCATION OF THE LEAK, OR WITH WET PH PAPER, WHICH WILL TURN BLUE. ATTEMPT TO CLOSE THE MAIN SOURCE VALVE PRIOR TO ENTERING THE AREA. IF THIS DOES NOT STOP THE RELEASE (OR IT IS NOT POSSIBLE TO REACH THE VALVE), ALLOW THE GAS TO RELEASE IN PLACE OR REMOVE IT TO A SAFE AREA AND ALLOW THE GAS TO BE RELEASED THERE. MONITOR THE SURROUNDING AREA FOR AMMONIA GAS AND OXYGEN LEVELS. THE AMMONIA LEVEL MUST BE BELOW 25 PPM AND THE ATMOSPHERE MUST HAVE AT LEAST 19.5 PERCENT OXYGEN BEFORE PERSONNEL CAN BE ALLOWED IN THE AREA WITHOUT SELF-CONTAINED BREATHING APPARATUS.

THIS IS A CORROSIVE GAS. PROTECTION OF ALL PERSONNEL AND THE AREA MUST BE MAINTAINED. ALL RESPONDERS MUST BE ADEQUATELY PROTECTED FROM EXPOSURE.

## PART III HOW CAN I PREVENT HAZARDOUS SITUATIONS FROM OCCURRING?

### HANDLING AND STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: AS WITH ALL CHEMICALS, AVOID GETTING AMMONIA ON YOU OR IN YOU. WASH HANDS AFTER HANDLING CHEMICALS. DO NOT EAT OR DRINK WHILE HANDLING CHEMICALS. ALL WORK PRACTICES SHOULD MINIMIZE THE RELEASE OF AMMONIA. BE AWARE OF ANY SIGNS OF EFFECTS OF EXPOSURE INDICATED IN SECTION 3 (HAZARD IDENTIFICATION); EXPOSURES TO FATAL CONCENTRATIONS OF AMMONIA COULD OCCUR RAPIDLY.

STORAGE AND HANDLING PRACTICES: ALL EMPLOYEES WHO HANDLE THIS MATERIAL SHOULD BE TRAINED TO HANDLE IT SAFELY. AVOID BREATHING THE GAS OR SPRAYS OR MISTS GENERATED BY AMMONIA. STORE CONTAINERS IN A COOL, DRY LOCATION, AWAY FROM DIRECT SUNLIGHT, SOURCES OF INTENSE HEAT, OR WHERE FREEZING IS POSSIBLE. USE ONLY COMPATIBLE MATERIALS FOR CYLINDERS, PROCESS LINES, AND OTHER AMMONIA-

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 008

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

HANDLING EQUIPMENT. LINES SHOULD BE PURGED WITH DRY NITROGEN BOTH BEFORE AND AFTER MAINTENANCE ACTIVITY. COPPER, TIN, ZINC AND THEIR ALLOYS ARE NOT SUITABLE MATERIALS FOR USE WITH AMMONIA. KEEP CONTAINER TIGHTLY-CLOSED WHEN NOT IN USE. KEEP CYLINDERS AWAY FROM INCOMPATIBLE MATERIAL. WASH THOROUGHLY AFTER USING THIS MATERIAL. WORKERS MUST BE THOROUGHLY TRAINED TO HANDLE AMMONIA WITHOUT CAUSING OVEREXPOSURE. PERIODIC INSPECTIONS OF PROCESS EQUIPMENT BY KNOWLEDGEABLE PERSONS SHOULD BE MADE TO ENSURE THAT THE EQUIPMENT IS USED APPROPRIATELY AND THE SYSTEM IS KEPT IN SUITABLE OPERATING CONDITION. AMMONIA EMERGENCY EQUIPMENT SHOULD BE AVAILABLE NEAR THE POINT OF USE.

WORKERS WHO HANDLE AMMONIA SHOULD WEAR PROTECTIVE CLOTHING, AS LISTED IN SECTION 8 (EXPOSURE CONTROLS -PERSONAL PROTECTION). INSTANT-ACTING SHOWERS SHOULD BE AVAILABLE IN THE EVENT OF AN EMERGENCY. SPECIAL WASH FOUNTAINS OR SIMILAR EQUIPMENT SHOULD BE AVAILABLE FOR EYE IRRIGATION.

PROPER RESPIRATORY PROTECTION EQUIPMENT MUST BE PROVIDED AND WORKERS USING SUCH EQUIPMENT MUST BE CAREFULLY TRAINED IN ITS OPERATION AND LIMITATIONS. PRECAUTIONS MUST ALWAYS BE TAKEN TO PREVENT SUCK-BACK OF FOREIGN MATERIALS INTO THE CYLINDER BY USING A CHECK-VALVE, VACUUM BREAK, OR TRAP, SINCE SUCK-BACK MAY CAUSE DANGEROUS PRESSURE CHANGES WITHIN THE CYLINDER. THE CYLINDER VALVE SHOULD BE CLOSED AFTER EACH USE. DETERMINE CYLINDER CONTENTS BY WEIGHT. THE TARE WEIGHT OF THE CYLINDER IS STAMPED ON THE CYLINDER.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: PROTECT CYLINDERS AGAINST PHYSICAL DAMAGE. STORE IN COOL, DRY, WELL-VENTILATED AREA, AWAY FROM SOURCES OF HEAT, IGNITION AND DIRECT SUNLIGHT. DO NOT ALLOW AREA WHERE CYLINDERS ARE STORED TO EXCEED 52 DEG C (125 DEG F). ISOLATE FROM INCOMPATIBLE MATERIALS (SEE SECTION 10, STABILITY AND REACTIVITY) FOR MORE INFORMATION). USE A CHECK VALVE OR TRAP IN THE DISCHARGE LINE TO PREVENT HAZARDOUS BACKFLOW. NEVER OPERATE WITH PRESSURE RELIEF DEVICES IN VALVES AND CYLINDERS. ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING OR EXPLOSION PROOF.

THE FOLLOWING RULES ARE APPLICABLE TO WORK SITUATIONS IN WHICH CYLINDERS ARE BEING USED :

BEFORE USE: MOVE CYLINDERS WITH SUITABLE HAND-TRUCK. SECURE CYLINDERS FIRMLY. HAVE THE VALVE PROTECTION CAP IN PLACE UNTIL CYLINDER IS READY FOR USE.

BEFORE USE: USE DESIGNATED REGULATORS, CGA FITTINGS, AND OTHER SUPPORT EQUIPMENT. DO NOT USE ADAPTERS. DO NOT USE OIL OR GREASE ON GAS HANDLING FITTINGS OR EQUIPMENT. ALL EQUIPMENT MUST BE PROPERLY GROUNDED AND BONDED. AMMONIA CYLINDERS SHOULD NEVER BE DIRECTLY CONNECTED TO A VESSEL CONTAINING A LIQUID SINCE SUCK-BACK MAY OCCUR CAUSING A VIOLENT REACTION WITHIN THE CYLINDER. TO PREVENT SUCK-BACK, A TRAP, CHECK VALVE OR VACUUM BREAK SHOULD BE INSERTED INTO THE LINE. THE TRAP SHOULD BE OF ADEQUATE SIZE TO TAKE THE TOTAL LIQUID VOLUME SUCKED-BACK. THE RATE OF GAS FLOW CAN BE INCREASED BY IMPROVING RECIRCULATION ABOUT THE CONTAINER OR BY INCREASING THE TEMPERATURE OF THE LIQUID IF IT IS BELOW NORMAL. NEVER APPLY HEAT DIRECTLY TO THE CYLINDER FOR ANY REASON. DO NOT MANIFOLD CYLINDERS TO INCREASE OUTPUT UNLESS CHECK VALVES HAVE

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 009

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

-----  
BEEN INSERTED AT THE CYLINDER OUTPUTS TO PREVENT EXCHANGE OF MATERIAL FROM ONE CYLINDER TO ANOTHER, CAUSING A CYLINDER TO BECOME OVER-FULL.

HOISTING OF CYLINDERS IS NOT RECOMMENDED. IF HOISTING CANNOT BE AVOIDED, ALWAYS USE A LIFTING CLAMP, CRADLE, OR CARRIER -- NEVER USE A LIFTING MAGNET, ROPE, OR CHAIN SPRING. DO NOT STORE AMMONIA CYLINDERS NEAR CYLINDERS OF HYDROGEN, ACETYLENE, FUEL GASES, ETHER, TURPENTINE, HYDROCARBONS, ORGANIC MATTER, OR FINELY-DIVIDED METALS. NEVER MIX AMMONIA WITH OTHER GASES IN THE CYLINDER. DO NOT STORE AMMONIA CYLINDERS NEAR ELEVATORS OR GANGWAYS OR IN LOCATIONS WHERE HEAVY OBJECTS MAY FALL AND STRIKE THEM.

OPEN CYLINDER VALVES SLOWLY. THE USE OF LARGE WRENCHES OR PIPE WRENCHES WILL DAMAGE THE VALVE. ONE COMPLETE TURN OF THE VALVE STEM IN A COUNTER-CLOCKWISE DIRECTION OPENS THE VALVE SUFFICIENTLY TO PERMIT MAXIMUM DISCHARGE. "EMPTY" CONTAINERS STILL CONTAIN AMMONIA GAS, AND SHOULD BE HANDLED WITH ALL PRECAUTIONS DESCRIBED IN THIS MSDS. IF LEAKS DEVELOP IN AMMONIA LINES, THEY MUST BE GIVEN PROMPT ATTENTION BECAUSE THEY WILL BECOME PROGRESSIVELY WORSE. REFER TO SECTION 6 (ACCIDENTAL RELEASE MEASURES) FOR RELEASE RESPONSE PROTOCOL.

BEFORE USE: CLOSE MAIN CYLINDER VALVE. REPLACE VALVE PROTECTION CAP (WHERE PROVIDED). MARK EMPTY CYLINDERS "EMPTY".

NOTE: USE ONLY DOT OR ASME CODE CONTAINERS DESIGNED FOR STORAGE. EARTH-GROUND AND BOND ALL LINES AND EQUIPMENT ASSOCIATED WITH AMMONIA. CLOSE VALVE AFTER EACH USE AND WHEN EMPTY. CYLINDERS MUST NOT BE RECHARGED EXCEPT BY OR WITH THE CONSENT OF OWNER. FOR ADDITIONAL INFORMATION REFER TO THE COMPRESSED GAS ASSOCIATION PAMPHLET P-1, SAFE HANDLING OF COMPRESSED GASES IN CONTAINERS. ADDITIONALLY, REFER TO CGA BULLETIN SB-2 "OXYGEN DEFICIENT ATMOSPHERES" AND NFPA BULLETIN 58.

TANK CAR SHIPMENTS: TANK CARS CARRYING AMMONIA SHOULD BE LOADED AND UNLOADED IN STRICT ACCORDANCE WITH TANK-CAR MANUFACTURER'S RECOMMENDATIONS AND ALL ESTABLISHED ON-SITE SAFETY PROCEDURES. APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE USED DURING TANK CAR OPERATIONS (SEE SECTION 8). ALL LOADING AND UNLOADING EQUIPMENT MUST BE INSPECTED, PRIOR TO EACH USE. LOADING AND UNLOADING OPERATIONS MUST BE ATTENDED, AT ALL TIMES. TANK CARS MUST BE LEVEL AND WHEELS MUST BE LOCKED OR BLOCKED PRIOR TO LOADING OR UNLOADING. TANK CAR (FOR LOADING) OR STORAGE TANK (FOR UNLOADING) MUST BE VERIFIED TO BE CORRECT FOR RECEIVING AMMONIA AND BE PROPERLY PREPARED, PRIOR TO STARTING THE TRANSFER OPERATIONS. HOSES MUST BE VERIFIED TO BE CLEAN AND FREE OF INCOMPATIBLE CHEMICALS, PRIOR TO CONNECTION TO THE TANK CAR OR VESSEL. VALVES AND HOSES MUST BE VERIFIED TO BE IN THE CORRECT POSITIONS, BEFORE STARTING TRANSFER OPERATIONS. A SAMPLE (IF REQUIRED) MUST BE TAKEN AND VERIFIED (IF REQUIRED) PRIOR TO STARTING TRANSFER OPERATIONS. ALL LINES MUST BE BLOWN-DOWN AND PURGED BEFORE DISCONNECTING THEM FROM THE TANK CAR OR VESSEL.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: FOLLOW

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 010

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

-----  
PRACTICES INDICATED IN SECTION 6 (ACCIDENTAL RELEASE MEASURES). MAKE CERTAIN APPLICATION EQUIPMENT IS LOCKED AND TAGGED-OUT SAFELY. PURGE GAS HANDLING EQUIPMENT WITH INERT GAS (E.G., NITROGEN) BEFORE ATTEMPTING REPAIRS.

#### 8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: USE WITH ADEQUATE VENTILATION. A HOOD WITH FORCED VENTILATION IS PREFERABLE. BECAUSE OF THE HIGH HAZARD ASSOCIATED WITH AMMONIA, STRINGENT CONTROL MEASURES SUCH AS A GAS CABINET ENCLOSURE OR ISOLATION MAY BE NECESSARY. DUCTWORK SHOULD BE CONSTRUCTED OF NON-METALLIC MATERIAL, OR SHOULD BE LINED TO RESIST CORROSION. IF NECESSARY, INSTALL AUTOMATIC MONITORING DEVICES FOR AMMONIA AND OXYGEN.

RESPIRATORY PROTECTION: MAINTAIN AIRBORNE CONTAMINANT CONCENTRATIONS BELOW EXPOSURE LIMITS LISTED IN SECTION 2 (COMPOSITION AND INFORMATION ON INGREDIENTS). IF RESPIRATORY PROTECTION IS NEEDED, USE ONLY PROTECTION AUTHORIZED IN THE U.S. FEDERAL OSHA STANDARD (29 CFR 1910.134), APPLICABLE U.S. STATE REGULATIONS, OR THE CANADIAN CSA STANDARD Z94.4-93 AND APPLICABLE STANDARDS OF CANADIAN PROVINCES. OXYGEN LEVELS BELOW 19.5% ARE CONSIDERED IDLH BY OSHA. IN SUCH ATMOSPHERES, USE OF A FULL-FACEPIECE PRESSURE/DEMAND SUPPLY OR A FULL FACEPIECE, SUPPLIED AIR RESPIRATOR WITH AUXILIARY SELF-CONTAINED AIR SUPPLY IS REQUIRED UNDER OSHA'S RESPIRATORY PROTECTION STANDARD (1910.134-1998). THE FOLLOWING NIOSH RESPIRATORY PROTECTION RECOMMENDATIONS FOR AMMONIA ARE PROVIDED FOR ADDITIONAL INFORMATION.

CONCENTRATION	RESPIRATORY EQUIPMENT
UP TO 250 PPM:	CHEMICAL CARTRIDGE RESPIRATOR OR SUPPLIED AIR RESPIRATOR (SAR).
UP TO 300 PPM:	SAR IN THE CONTINUOUS FLOW MODE, OR A POWERED AIR PURIFYING RESPIRATOR (PAPR) WITH AMMONIA CARTRIDGES, OR FULL-FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR WITH AMMONIA CARTRIDGE, OR A GAS MASK WITH AN AMMONIA CANISTER, OR FULL-FACEPIECE SELF-CONTAINED BREATHING APPARATUS (SCBA), OR FULL-FACEPIECE SAR.

NIOSH RESPIRATORY PROTECTION RECOMMENDATIONS FOR AMMONIA IN

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATION OR IDLH CONDITIONS: POSITIVE PRESSURE, FULL-FACEPIECE SCBA OR POSITIVE PRESSURE, FULL-FACEPIECE SAR WITH AN AUXILIARY POSITIVE PRESSURE SCBA.

ESCAPE: GAS MASK WITH CANISTER TO PROTECT AGAINST AMMONIA OR ESCAPE-TYPE SCBA

EYE PROTECTION: SPLASH GOGGLES OR SAFETY GLASSES AND FACE SHIELD. IF NECESSARY, REFER TO U.S. OSHA 29 CFR 1910.133, OR CANADIAN STANDARDS.

SKIN AND PROTECTION: WEAR MECHANICAL RESISTANT GLOVES WHEN HANDLING CYLINDERS OF AMMONIA. WEAR NEOPRENE GLOVES FOR INDUSTRIAL USE. USE TRIPLE GLOVES FOR SPILL RESPONSE (SEE SECTION 6 ACCIDENTAL RELEASE MEASURES). IF NECESSARY, REFER TO U.S. OSHA 29 CFR 1910.138 OR APPROPRIATE STANDARDS OF CANADA.

REPORT NUMBER: 703

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 011

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

-----  
PROTECTION FOR TANK CAR OPERATIONS: SPLASH-SUIT, GLOVES, GOGGLES, FACE-SHIELD, BOOTS AND HARD-HAT SHOULD BE WORN DURING OPERATIONS INVOLVING TANK-CARS OR TRUCKS CONTAINING AMMONIA.

BODY PROTECTION: USE BODY PROTECTION APPROPRIATE FOR TASK. TRANSFER OF LARGE QUANTITIES UNDER PRESSURE MAY REQUIRE PROTECTIVE EQUIPMENT APPROPRIATE TO PROTECT EMPLOYEES FROM SPLASHES OF LIQUEFIED PRODUCT, AS WELL PROVIDE SUFFICIENT INSULATION FROM EXTREME COLD. IF A HAZARD OF INJURY TO THE FEET EXISTS DUE TO FALLING OBJECTS, ROLLING OBJECTS, WHERE OBJECTS MAY PIERCE THE SOLES OF THE FEET OR WHERE EMPLOYEE'S FEET MAY BE EXPOSED TO ELECTRICAL HAZARDS, USE FOOT PROTECTION, AS DESCRIBED IN U.S. OSHA 29 CFR.

#### 9. PHYSICAL AND CHEMICAL PROPERTIES

VAPOR DENSITY @32 DEG F:	0.77 KG/M3 (0.048 IB/FT3)
EVAPORATION RATE (NBUAC = 1):	NOT APPLICABLE.
SPECIFIC GRAVITY (AIR = 1):	0.594
FREEZING POINT:	-77 DEG C (-107 DEG F)
SOLUBILITY IN WATER:	84%
BOILING POINT A 1 ATM:	-33.4 DEG C (-28.2 DEG F)
ODOR THRESHOLD:	0.6 - 53 PPM (DETECTION)
VAPOR PRESSURE (PSIA):	128.8
SPECIFIC VOLUME (FT3/LB):	22.6
EXPANSION RATIO:	NOT APPLICABLE.
PH:	NOT APPLICABLE. (A 1% SOLUTION IN WATER WILL HAVE A PH > 13)

INEFFICIENT WATER/OIL DISTRIBUTION: NOT DETERMINED.

APPEARANCE AND COLOR: AMMONIA IS A PUNGENT-SMELLING, TOXIC, CORROSIVE GAS HAVING A SUFFOCATING ODOR. THIS GAS IS LIGHTER THAN AIR AND FUMES STRONGLY IN MOIST AIR, PRODUCING A CLOUD OF AMMONIUM HYDROXIDE MIST.

HOW TO DETECT THIS SUBSTANCE (WARNING PROPERTIES): THE ODOR AND DENSE APPEARANCE OF THIS GAS ARE DISTINCTIVE WARNING PROPERTIES ASSOCIATED WITH AMMONIA.

#### 10. STABILITY AND REACTIVITY

STABILITY: STABLE.

DECOMPOSITION PRODUCTS: AMMONIA GAS DECOMPOSES INTO HYDROGEN AND NITROGEN AT ABOUT 450-500 DEG C (842-932 DEG F). DECOMPOSITION WILL OCCUR AT LOWER TEMPERATURES IN THE PRESENCE OF METALS SUCH AS IRON, NICKEL AND ZINC AND, TO A LESSER EXTENT, CATALYTIC SURFACES, SUCH AS PORCELAIN AND PUMICE. IN THE PRESENCE OF CATALYSTS, DECOMPOSITION BEGINS AS LOW AS 300 DEG (572 DEG F) AND IS COMPLETE AT 500-600 DEG C (932-1112 DEG F). IT HAS ALSO BEEN REPORTED THAT THE MAIN PRODUCTS OF COMBUSTION IN AIR (AT/OR ABOVE 780 DEG C (1436 DEG

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 012

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

-----  
F)) ARE NITROGEN AND WATER, WITH SMALL AMOUNTS OF NITROGEN DIOXIDE AND AMMONIUM NITRATE.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: AMMONIA IS NOT COMPATIBLE WITH MOST METALS, ACIDS, OR OXIDIZERS. AMMONIA CAN FORM EXPLOSIVE COMPOUNDS WITH MERCURY, GOLD OR SILVER COMPOUNDS OR THE ELEMENTS. AMMONIA REACTS VIOLENTLY WITH TELLURIUM TETRABROMIDE AND TETRACHLORIDE, CHLORINE, BROMINE, FLUORINE, OR THE INTERHALOGEN COMPOUNDS, AND WITH ACID HALIDES, ETHYLENE OXIDE, AND HYPOCHLORITES (INCLUDING HOUSEHOLD BLEACH). POISONING OR DEATH CAN OCCUR IF AMMONIA (OR AMMONIA-CONTAINING PRODUCTS) ARE MIXED WITH HOUSEHOLD BLEACH.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

CONDITIONS TO AVOID: EXTREME HEAT, FIRE, OR CONTACT WITH INCOMPATIBLE CHEMICALS.

PART IV IS THERE ANY OTHER USEFUL INFORMATION ABOUT THIS MATERIAL?

#### 1. TOXICOLOGICAL INFORMATION

TOXICITY DATA: THE FOLLOWING INFORMATION IS FOR AMMONIA (GAS):

LCLO (INHALATION, HUMAN) = 30000 PPM/ 5 MINUTES

LCLO (INHALATION, HUMAN) = 20 PPM; IRRITATION

LDLO (UNKNOWN, MAN) = 132 MG/KG

LD50 (ORAL, RAT) = 350 MG/KG

LCLO (INHALATION, RAT) = 2000 PPM/4 HOURS

LCLO (INHALATION, CAT) = 7000 PPM/1 HOUR

LCLO (INHALATION, CAT) = 1000 PPM/10 MINUTES

LCLO (INHALATION, MAMMAL) = 5000 PPM/5 MINUTES

LCLO (INHALATION, RABBIT) = 7000 PPM/1 HOUR

MUTATION IN MICROORGANISMS (ESCHERICHIA COH) = 1500 PPM/3 HOURS

GENOTOXIC ANALYSIS (RAT, INHALATION) = 19,800 5G/M3/16 WEEKS

LD50 (INHALATION, MOUSE) = 4837 PPM/1 HOUR

SUSPECTED CANCER AGENT: AMMONIA IS NOT FOUND ON THE FOLLOWING LISTS: FEDERAL SHA Z LIST, NTP, CAUOSHA OR IARC AND THEREFORE IS NOT CONSIDERED TO BE, NOR SUSPECTED TO BE A CANCER-CAUSING AGENT BY THESE AGENCIES.

IRRITANCY OF PRODUCT: AMMONIA IS SEVERELY IRRITATING TO CONTAMINATED TISSUE.

SENSITIZATION OF PRODUCT: AMMONIA IS NOT KNOWN TO BE A SKIN OR RESPIRATORY SENSITIZER.

REPRODUCTIVE TOXICITY INFORMATION: LISTED BELOW IS INFORMATION CONCERNING THE EFFECTS OF AMMONIA ON THE HUMAN REPRODUCTIVE SYSTEM.

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 013

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

MUTAGENICITY: AMMONIA HAS NOT BEEN REPORTED TO CAUSE MUTAGENIC EFFECTS IN HUMANS. AMMONIA HAS BEEN REPORTED TO CAUSE MUTAGENIC EFFECTS IN SPECIFIC ANIMAL TISSUES DURING EXPERIMENTAL STUDIES WITH EXPOSURES AT RELATIVELY HIGH DOSES.

EMBRYOTOXICITY: AMMONIA HAS NOT BEEN REPORTED TO CAUSE EMBRYOTOXIC EFFECTS

TERATOGENICITY: AMMONIA HAS NOT BEEN REPORTED TO CAUSE TERATOGENIC EFFECTS.

REPRODUCTIVE TOXICITY: AMMONIA IS NOT EXPECTED TO CAUSE ADVERSE REPRODUCTIVE EFFECTS IN HUMANS.

A MUTAGEN IS A CHEMICAL WHICH CAUSES PERMANENT CHANGES TO GENETIC MATERIAL (DNA) SUCH THAT THE CHANGES WILL PROPAGATE THROUGH GENERATION LINES. AN EMBRYOTOXIN IS A CHEMICAL WHICH CAUSES DAMAGE TO A DEVELOPING EMBRYO (I.E. WITHIN THE FIRST EIGHT WEEKS OF PREGNANCY IN HUMANS), BUT THE DAMAGE DOES NOT PROPAGATE ACROSS GENERATIONAL LINES. A TERATOGEN IS A CHEMICAL WHICH CAUSES DAMAGE TO A DEVELOPING FETUS, BUT THE DAMAGE DOES NOT PROPAGATE ACROSS GENERATIONAL LINES. A REPRODUCTIVE TOXIN IS ANY SUBSTANCE WHICH INTERFERES IN ANY WAY WITH THE REPRODUCTIVE PROCESS.

BIOLOGICAL EXPOSURE INDICES (BEIS): CURRENTLY, BIOLOGICAL EXPOSURE INDICES (BETIS) HAVE NOT BEEN DETERMINED FOR AMMONIA.

## 12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: AMMONIA IS STABLE AND FOUND NATURALLY IN THE ENVIRONMENT (SOURCES INCLUDE VOLCANOES). ALL WORK PRACTICES SHOULD BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION. ADDITIONAL ENVIRONMENTAL INFORMATION FOR AMMONIA IS AVAILABLE AS FOLLOWS:

ATMOSPHERIC FATE: IT IS ASSUMED THAT AMMONIA COMBINES WITH SULFATE ION IN THE ATMOSPHERE OR IN WASHOUT BY RAINFALL RESULTING IN A RAPID RETURN OF AMMONIA TO THE SOIL.

BIODEGRADATION: WHEN AMMONIA APPEARS IN WATER UNDER THE NORMAL CONDITIONS (AEROBIC), IT IS RAPIDLY CONVERTED TO NITRATE BY NITRIFICATION; THE PRINCIPAL WATER CONTAMINANT NORMALLY BEING NITRATE. THE PH IN WATER IS INCREASED BY THE PRESENCE OF AMMONIA ION, IN THE FORM OF HYDROXIDE IONS. BACTERIA CONVERT THE AMMONIA TO NITRATE CREATING AN OXYGEN DEMAND (BOD) SEVERAL DAYS AFTER THE INTRODUCTION OF AMMONIA. THE BACTERIA THAT OXIDIZE AMMONIA TO NITRATE ARE LARGELY OF THE GENUS NITROSOMONAS; CONVERSION OF NITRITE TO NITRATE IS CATALYZED OUT PRIMARILY BY THE GENUS NITROBACTER. TEMPERATURE, OXYGEN SUPPLY, AND PH OF THE WATER ARE FACTORS IN DETERMINING THE RATE OF OXIDATION.

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 014

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

-----  
BIOCONCENTRATION: PLANTS HAVE A HIGH AFFINITY FOR GASEOUS AMMONIA WHEN LEAF STOMATA ARE OPEN IN DAYLIGHT.

SOIL ADSORPTION/MOBILITY: AMMONIA IS STRONGLY ADSORBED ON SOIL, AND ON SEDIMENT PARTICLES AND COLLOIDS IN WATER. THIS ADSORPTION RESULTS IN HIGH CONCENTRATIONS OF SORBED AMMONIA IN OXIDIZED SEDIMENTS. UNDER ANOXIC CONDITIONS, THE ADSORPTIVE CAPACITY OF SEDIMENTS IS LESS, RESULTING IN THE RELEASE OF AMMONIA TO EITHER THE WATER COLUMN OR AN OXIDIZED SEDIMENT LAYER ABOVE. IN CLAY, THE ION TENDS TO BE ADSORBED ON THE NEGATIVE ADSORPTION SITES OF CLAY COLLOIDS. IT MAY SUBSTITUTE FOR POTASSIUM IN THE LATTICE STRUCTURE OF A CLAY MINERAL.

EFFECT OF MATERIAL ON PLANTS OR ANIMALS: DUE TO THE CORROSIVE NATURE OF AMMONIA, ANIMALS EXPOSED TO THIS PRODUCT WILL EXPERIENCE TISSUE DAMAGE, BURNS, AND MAY BE KILLED. OXYGEN DISPLACEMENT CAN ALSO BE A FACTOR IN THE TOXICITY OF AMMONIA. PLANTS CONTAMINATED WITH AMMONIA MAY BE ADVERSELY AFFECTED OR DESTROYED.

EFFECT OF CHEMICAL ON AQUATIC LIFE: AMMONIA IS VERY SOLUBLE IN WATER, AND IN LOW CONCENTRATIONS OF AMMONIA IN WATER IS DETRIMENTAL TO AQUATIC LIFE. IF A RELEASE OF AMMONIA OCCURS NEAR A RIVER OR OTHER BODY OF WATER, THE RELEASE HAS THE POTENTIAL TO KILL FISH AND OTHER AQUATIC LIFE. ADDITIONAL AQUATIC TOXICITY INFORMATION IS AVAILABLE FOR AMMONIA AS FOLLOWS:

LC (GOLDFISH, YELLOW PERCH) = 2.0-2.5 PPM/1- 4 DAYS

LC100 (CRAYFISH) = 60-80 PPM/3 DAYS

LCM (FATHEAD MINNOW) = 8.2 PPM/96 HOURS LC50 (COHO SALMON) = 0.45 MG/U96 HOURS

LC50 (GUPPY FRY) = 1.2-74 MG/U72 HOURS

LC50 (CUTTHROAT TROUT FRY, SALMO DARK) = 0.5-  
.8 MG/U96 HOURS

LC50 (RAINBOW TROUT: FERTILIZED EGG, ALEVINS (050 DAYS OLD), FRY (85 DAYS OLD),

ADULTS) = >3.58, >3.58, 0.068, 0.097 MG/U24 HOURS

LC50 (WALKING CATFISH) = 0.28 MG/U48 HOURS

LC50 (SALMO TRUTTA) = >0.15 MG/L, 0.6-0.9 MG/L / 18 HOURS, 96 HOURS

LC50 (SALVELINUS FONTINALIS) = 0.96-1.05 MG/L, 96 HOURS

LC50 (CATOSTOMUS PLATYRHYNCHOS) = 0.670-0.82 MG/L, 96 HOURS

LC50 (OIMEPHALES PROMELAS) = 0.73-3.4 MG/L, 96 HOURS

LC50 (CATOSTMUS COMMERSONI) = 0.79-1.4 MG/L, 96 HOURS

LC50 (LEPOMIS MACROCHIRUS) = 0.26-4.6 MG/L, 96 HOURS

LC50 (LEPOMIS MACROCHIRUS) = 0.024-2.3 MG/L, 48 HOURS

LC50 (MICROPTERUS SALMOIDES) = >0.21-1.7 MG/L, 96 HOURS

LC50 (NOTROPIS LUTRENSIS) = 0.9-1.1 MG/L, 96 HOURS

LC50 (MUGLI CEPHALUS) = 1.2-2.4 MG/L, 96 HOURS

LC50 (MORONE AMERICANA) = 0.52-2.13 MG/L, 96 HOURS

LC50 (NOTROPIS SPILOPTERUS) = 1.2-1.35 MG/L, 96 HOURS

LC50 (LEPOMIS CYANELLUS) = 0.6-2.1 MG/L, 96 HOURS

REPORT NUMBER: 703  
MSDS NO: P1043VS  
MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 015

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

LC50 (LEPOMIS GIBBOSUS) = 0.14-0.86 MG/L, 96 HOURS

### 13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: PRODUCT REMOVED FROM THE CYLINDER MUST BE DISPOSED OF IN ACCORDANCE WITH APPROPRIATE U.S. FEDERAL, STATE, AND LOCAL REGULATIONS OR WITH REGULATIONS OF CANADA AND ITS PROVINCES. RETURN CYLINDERS WITH RESIDUAL PRODUCT TO AIRGAS, INC. DO NOT DISPOSE OF LOCALLY.

### 14. TRANSPORTATION INFORMATION

THIS GAS IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

FOR U.S. DOMESTIC SHIPMENTS:

PROPER SHIPPING NAME: AMMONIA, ANHYDROUS  
HAZARD CLASS NUMBER AND DESCRIPTION: 2.2 (NON-FLAMMABLE GAS)  
UN IDENTIFICATION NUMBER: UN 1005  
PACKING GROUP: NOT APPLICABLE  
DOT LABEL(S) REQUIRED: CLASS 2.2 (NON-FLAMMABLE GAS)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 125 FOR INTERNATIONAL SHIPMENTS:

PROPER SHIPPING NAME: AMMONIA, ANHYDROUS  
HAZARD CLASS NUMBER AND DESCRIPTION: 2.3 (TOXIC GAS), 8 (CORROSIVE)  
UN IDENTIFICATION NUMBER: UN 1005  
PACKING GROUP: NOT APPLICABLE  
DOT LABEL(S) REQUIRED: CLASS 2.3 (TOXIC GAS); CLASS 8 (CORROSIVE)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 125

MARINE POLLUTANT: AMMONIA IS NOT DESIGNATED BY THE DEPARTMENT OF TRANSPORTATION TO BE A MARINE POLLUTANT (49 CFR 172.101, APPENDIX B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: AMMONIA IS CONSIDERED AS DANGEROUS GOODS, PER REGULATIONS OF TRANSPORT CANADA. THE USE OF THE ABOVE U.S. DOT INFORMATION FROM THE U.S. 49 CFR REGULATIONS IS ALLOWED FOR SHIPMENTS THAT ORIGINATE IN THE U.S. FOR SHIPMENTS VIA GROUND VEHICLE OR RAIL THAT ORIGINATE IN CANADA, THE FOLLOWING INFORMATION IS APPLICABLE.

PROPER SHIPPING NAME: AMMONIA, ANHYDROUS  
HAZARD CLASS NUMBER AND DESCRIPTION: 2.2 (NON-FLAMMABLE GAS), 8 (CORROSIVE)  
UN IDENTIFICATION NUMBER: UN 1005  
PACKING GROUP: NOT APPLICABLE  
HAZARD LABEL(S) REQUIRED: CLASS 2.2 (NON-FLAMMABLE GAS); CLASS 8 (CORROSIVE)

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 016

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

SPECIAL PROVISIONS: NONE  
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 0  
ERAP INDEX: 3000  
PASSENGER CARRYING SHIP INDEX: FORBIDDEN  
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: FORBIDDEN  
MARINE POLLUTANT: POTENTIAL MARINE POLLUTANT.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: AMMONIA IS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTIONS 302, 304, AND 313 OF TITLE III OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT, AS FOLLOWS:

CHEMICAL NAME	SARA 302 (40 CFR 355, APPENDIX A)	SARA 304 (40 CFR TABLE 302.4)	SARA 313 (40 CFR 372.65)
AMMONIA	YES	YES	YES

U.S. SARA THRESHOLD PLANNING QUANTITY: 500 LB (227 KG)

U.S. CERCLA REPORTABLE QUANTITY (RQ): AMMONIA CERCLA RQ = 100 LB (45.4 KG); AMMONIA EHS (EXTREMELY HAZARDOUS SUBSTANCE) RQ = 100 LB (45.4 KG).

U.S. TSCA INVENTORY STATUS: AMMONIA IS LISTED ON THE TSCA INVENTORY.

OTHER U.S. FEDERAL REGULATIONS: AMMONIA IS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 112(R) OF THE CLEAN AIR ACT. THE THRESHOLD QUANTITY OF AMMONIA IS 10,000 LB (4450 KG). COMPLIANCE WITH THE OSHA PROCESS SAFETY STANDARD, 29 CFR 1910.119 MAY BE APPLICABLE TO OPERATIONS INVOLVING THE USE OF AMMONIA. UNDER THIS REGULATION AMMONIA IS LISTED IN APPENDIX A. THE THRESHOLD QUANTITY OF AMMONIA UNDER THIS REGULATION IS 10,000 LB (4450 KG). AMMONIA IS DESIGNATED AS A HAZARDOUS SUBSTANCE UNDER SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT AND FURTHER REGULATED BY THE CLEAN WATER ACT AMENDMENTS OF 1977 AND 1978. THESE REGULATIONS APPLY TO DISCHARGES OF AMMONIA.

U.S. STATE REGULATORY INFORMATION: AMMONIA IS COVERED UNDER THE FOLLOWING SPECIFIC STATE REGULATIONS:

ALASKA - DESIGNATED TOXIC AND HAZARDOUS SUBSTANCES: AMMONIA.  
CALIFORNIA - PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS: AMMONIA.  
FLORIDA - SUBSTANCE LIST: AMMONIA.  
ILLINOIS - TOXIC SUBSTANCE LIST: AMMONIA.  
IOWA - SECTION 302/313 LIST: AMMONIA.  
MASSACHUSETTS - SUBSTANCE LIST: AMMONIA.  
MINNESOTA - LIST OF HAZARDOUS SUBSTANCES: AMMONIA.  
MISSOURI - EMPLOYER INFORMATION/TOXIC SUBSTANCE LIST: AMMONIA.

REPORT NUMBER: 703

UNIVAR USA INC.

PAGE: 017

MSDS NO: P1043VS

MATERIAL SAFETY DATA SHEET

MAINFRAME UPLOAD DATE: 12/08/05

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

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NEW JERSEY - RIGHT TO KNOW HAZARDOUS SUBSTANCE LIST: AMMONIA.  
NORTH DAKOTA - LIST OF HAZARDOUS CHEMICALS, REPORTABLE QUANTITIES: AMMONIA.  
PENNSYLVANIA - HAZARDOUS SUBSTANCE LIST: AMMONIA  
RHODE ISLAND - HAZARDOUS SUBSTANCE LIST: AMMONIA  
TEXAS - HAZARDOUS SUBSTANCE LIST: AMMONIA.  
WEST VIRGINIA - HAZARDOUS SUBSTANCE LIST: AMMONIA  
WISCONSIN - TOXIC AND HAZARDOUS SUBSTANCES: AMMONIA

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):  
AMMONIA IS NOT ON THE CALIFORNIA PROPOSITION 65 LISTS.

CGA LABELING:

DANGER:

CORROSIVE LIQUID AND GAS UNDER PRESSURE.

CAN CAUSE EYE, SKIN, AND RESPIRATORY TRACT BURNS.

AVOID BREATHING GAS.

STORE AND USE WITH ADEQUATE VENTILATION.

KEEP AWAY FROM HEAT, FLAMES, AND SPARKS.

DO NOT GET IN EYES, ON SKIN OR CLOTHING.

USE ONLY WITH EQUIPMENT OF COMPATIBLE MATERIAL AND CONSTRUCTION.

CYLINDER TEMPERATURE SHOULD NOT EXCEED 52 DEG C (125 DEG F).

CLOSE VALVE AFTER EACH USE AND WHEN EMPTY.

USE IN ACCORDANCE WITH THE MATERIAL SAFETY DATA SHEET.

NOTE:

SUCK-BACK INTO CYLINDER MAY CAUSE RUPTURE.

ALWAYS USE A BACK FLOW PREVENTATIVE DEVICE IN PIPING.

FIRST-AID:

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL  
RESPIRATION. (RESCUER MAY RECEIVE CHEMICAL BURNS AS A RESULT OF GIVING MOUTH  
TO MOUTH). IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN. KEEP  
UNDER MEDICAL OBSERVATION.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH WATER FOR AT LEAST 15  
MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. CALL A PHYSICIAN.  
WASH CLOTHING BEFORE REUSE. (DISCARD CONTAMINATED SHOES).  
DO NOT REMOVE THIS PRODUCT LABEL.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: AMMONIA IS ON THE DSL INVENTORY.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:

AMMONIA IS NOT ON THE CEPA PRIORITIES SUBSTANCES LISTS.

CANADIAN WHMIS SYMBOLS:

CLASS A: COMPRESSED GAS

CLASS E: CORROSIVE MATERIAL

REPORT NUMBER: 703  
MSDS NO: P1043VS  
MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 018  
VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

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----- FOR ADDITIONAL INFORMATION -----  
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CONTACT: MSDS COORDINATOR UNIVAR USA INC.  
DURING BUSINESS HOURS, PACIFIC TIME (425)889-3400

04/28/06 14:09 PRODUCT: 744672 CUST NO: 386323 ORDER NO: 325997

----- NOTICE -----  
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CONSEQUENTIAL DAMAGES. \*\*  
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PROCESS.

\* \* \* E N D O F M S D S \* \* \*

## APPENDIX B

### **EMERGENCY RESPONSE PROCEDURE FOR AN AMMONIA EXPLOSION IN A BUILDING**

**(See also Section 2.1.2 of the Emergency Response Plan)**

The following steps will be followed in the event of an ammonia explosion in a building. The steps should be followed in the order set out below, unless more than one crew is mobilized, in which case some of the steps can be taken simultaneously by different crews. The Incident Commander has the authority to vary from the steps set out below if he deems it necessary in the circumstances to protect public health, safety or the environment.

**CAUTION: INHALATION OF ANYDROUS AMMONIA CAN CAUSE INCAPACITATION, SERIOUS INJURY AND DEATH.**

1. An ammonia explosion would most likely occur suddenly. The person who would first witness the explosion should immediately contact his or her supervisor who would activate the evacuation alarm by using the "dial 184" notification system.
2. Evacuate all personnel from the Mill site to a location upwind of the impacted area, and account for all personnel, including all contractors and visitors at the Mill and all ore, product and reagent truck drivers, in accordance with the Emergency Evacuation and Shutdown Procedure described in Appendix J.
3. Determine Incident Commander. The Incident Commander will be the Mill Manager, or in his absence the Mill Superintendent, or in the absence of both the Mill Manager and the Mill Superintendent, the RSO. Shift Foremen are in charge and are responsible for all emergency procedures until the Incident Commander arrives.
4. Determine crews that may be required (see Section 4.2.2 of the Plan for a discussion of the available crews at the disposal of the Incident Commander).
5. Mobilize trained personnel and emergency equipment such as SCBAs, first aid equipment etc. See U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration 2008 Emergency Response Guidebook (the "DOT Guidebook") for appropriate protective clothing. In that Guidebook, anhydrous ammonia has an ID No. of 1005 and is covered by Guide No. 125. A copy of Guide 125 is attached to this Appendix.
6. Initiate rescue operations for any people who may be trapped as a result of the explosion; do this only with properly trained and equipped personnel.
7. Guard against possible fires by shutting off electrical circuits, isolating gas lines and eliminating ignition sources from affected areas.

8. In the event of fire, follow procedures set out on Guide No. 125. If the fire is in the SX Building, follow the procedures in Appendix E in addition to the procedures in this Appendix.
9. Isolate utility lines affected by the fire.
10. Extinguish the fire and post a fire watch for flare-ups.
11. In cases where the fire is not extinguished within thirty minutes of discovery, the area must be barricaded off after extinguishing and left undisturbed until released by MSHA and DUSA management.
13. Attend to any injured persons:
  - One of the following EMT-trained personnel should be contacted, if they are on-site to aid in the event of any injuries to personnel:
    - David Turk;
  - Move victim to fresh air;
  - Give artificial respiration if victim is not breathing;
  - **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device;**
  - Administer oxygen if breathing is difficult;
  - Remove and isolate contaminated clothing and shoes;
  - In case of contact with liquefied gas, thaw frosted parts with lukewarm water;
  - In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes;
  - In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin;
  - Control any bleeding;
  - Treat for shock, if necessary;
  - Immobilize any fractures and stabilize for transportation;
  - Scan the injured for excessive alpha prior to transporting if time allows
    - (If alpha is excessive or there is no time to scan, notify the clinic/hospital personnel and the Radiation Safety Office);
  - Keep victim warm and quiet;
  - Keep victim under observation. Effects of contact or inhalation may be delayed;
  - The Safety Coordinator or a Safety Technician will notify the following as needed:
    - Blanding Clinic 678-2254 or 678-3434 (930 N. 400 W.)
    - San Juan Hospital, Monticello 678-2830 or 587-2116 (364 W. 1st N.)
    - Ambulance Service, Blanding Dial 911
  - Ensure that medical personnel are aware of the materials involved and take precautions to protect themselves; and





personnel to re-enter the facility or any portion of the facility or whether or not any portion of the facility must remain shut down;

20. Inspect facility for damage that may have resulted from a fire or explosion and identify any of the following types of damage to facilities

- Structural damage that could pose a hazard to workers. Any such areas should be cordoned off as appropriate;
- Damage or disability to equipment that is required to prevent releases of radionuclides exceeding regulatory limits, to prevent exposures to radioactive materials exceeding regulatory limits or to mitigate the consequences of an accident, when:
  - The equipment is required to be available and operable when it is disabled or fails to function; and
  - No redundant equipment is available and operable to perform the required safety function.

In the event of any such damage, the Incident Commander or RSO will make a determination if it is safe for personnel to re-enter the facility or any portion of the facility or whether or not any portion of the facility must be shut down because it cannot be operated safely and in accordance with all license or permit conditions, laws and regulations; and

- Damage to any licensed material or any device, container or equipment containing licensed material.

21. The Incident Commander or RSO will make a determination if it is safe for personnel to re-enter the facility or any portion of the facility or whether or not any portion of the facility must remain shut down;

22. The Incident Commander will make the decision to terminate the emergency or enter into recover mode.

23. Notification of Regulatory Agencies:

A member of Mill management or Corporate management will notify the following regulating agencies as indicated below:

- Immediate Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified:

- Immediately if the event involved byproduct, source or special nuclear material possessed by the Mill that may have caused or threatens to cause any individual to receive doses at the levels specified in R313-15-1202(1)(a) or the release of radioactive material inside or outside of the restricted area that could cause an individual to receive an intake five times the annual permissible intake as specified in R313-15-1202(1)(b); and
  - as soon as possible, but not later than 4 hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed regulatory limits or releases of licensed material that could exceed regulatory limits (events may include fires, explosions, toxic gas releases etc.) (see 10 CFR 40.60)
- 24 Hour Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified within 24 hours after the discovery of:

- any of the events listed in 10 CFR 40.60; or
  - any of the events listed in R313-15-1202(2).
- Report to MSHA

Any fire at the Mill facility must be reported within 15 minutes to the MSHA -1-800-746-1553.

#### 24. Written Reports

The RSO will prepare a written report of the incident for Mill files. In addition, the RSO will prepare a written report and submit it to the State of Utah Division of Radiation Control within 30 days of the incident. The written report will contain the information required by R313-15-1203(2) and 10 CFR 40.60 (c)(2), as applicable.

ID No.	Guide No.	Name of Material	ID No.	Guide No.	Name of Material
—	112	Ammonium nitrate-fuel oil mixtures	1013	120	Carbon dioxide, compressed
—	158	Biological agents	1014	122	Carbon dioxide and Oxygen mixture
—	112	Blasting agent, n.o.s.	1014	122	Carbon dioxide and Oxygen mixture, compressed
—	112	Explosive A	1014	122	Oxygen and Carbon dioxide mixture
—	112	Explosive B	1014	122	Oxygen and Carbon dioxide mixture, compressed
—	114	Explosive C	1015	126	Carbon dioxide and Nitrous oxide mixture
—	112	Explosives, division 1.1, 1.2, 1.3, 1.5 or 1.6	1015	126	Nitrous oxide and Carbon dioxide mixture
—	114	Explosives, division 1.4			
—	153	Toxins			
1001	116	Acetylene	1016	119	Carbon monoxide
1001	116	Acetylene, dissolved	1016	119	Carbon monoxide, compressed
1002	122	Air, compressed	1017	124	Chlorine
1003	122	Air, refrigerated liquid (cryogenic liquid)	1018	126	Chlorodifluoromethane
1003	122	Air, refrigerated liquid (cryogenic liquid), non-pressurized	1018	126	Refrigerant gas R-22
1005	125	Ammonia, anhydrous	1020	126	Chloropentafluoroethane
1005	125	Anhydrous ammonia	1020	126	Refrigerant gas R-115
1006	121	Argon	1021	126	1-Chloro-1,2,2,2-tetrafluoroethane
1006	121	Argon, compressed	1021	126	Chlorotetrafluoroethane
1008	125	Boron trifluoride	1021	126	Refrigerant gas R-124
1008	125	Boron trifluoride, compressed	1022	126	Chlorotrifluoromethane
1009	126	Bromotrifluoromethane	1022	126	Refrigerant gas R-13
1009	126	Refrigerant gas R-13B1	1023	119	Coal gas
1010	116P	Butadienes, stabilized	1023	119	Coal gas, compressed
1010	116P	Butadienes and hydrocarbon mixture, stabilized	1026	119	Cyanogen
1011	115	Butane	1026	119	Cyanogen gas
1011	115	Butane mixture	1027	115	Cyclopropane
1012	115	Butylene	1028	126	Dichlorodifluoromethane
1013	120	Carbon dioxide	1028	126	Refrigerant gas R-12
			1029	126	Dichlorofluoromethane
			1029	126	Refrigerant gas R-21

**POTENTIAL HAZARDS****HEALTH**

- **TOXIC**; may be fatal if inhaled, ingested or absorbed through skin.
- Vapors are extremely irritating and corrosive.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

**FIRE OR EXPLOSION**

- Some may burn but none ignite readily.
- Vapors from liquefied gas are initially heavier than air and spread along ground.
- Some of these materials may react violently with water.
- Cylinders exposed to fire may vent and release toxic and/or corrosive gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

**PUBLIC SAFETY**

- **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Keep out of low areas.
- Ventilate closed spaces before entering.

**PROTECTIVE CLOTHING**

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations **ONLY**; it is not effective in spill situations where direct contact with the substance is possible.

**EVACUATION****Spill**

- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under "PUBLIC SAFETY".

**Fire**

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

**EMERGENCY RESPONSE****FIRE****Small Fire**

- Dry chemical or CO<sub>2</sub>.

**Large Fire**

- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.
- Do not get water inside containers.
- Damaged cylinders should be handled only by specialists.

**Fire involving Tanks**

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • ALWAYS stay away from tanks engulfed in fire.

**SPILL OR LEAK**

- Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Do not direct water at spill or source of leak.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. • Isolate area until gas has dispersed.

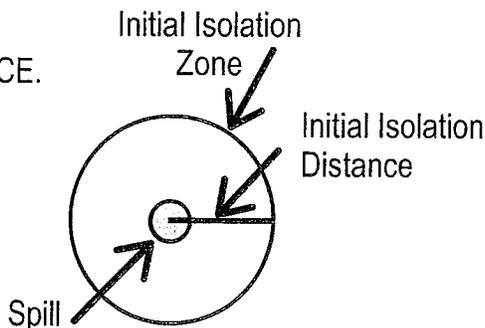
**FIRST AID**

- Move victim to fresh air. • Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.**
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- **In case of contact with Hydrogen fluoride, anhydrous (UN1052), flush skin and eyes with water for 5 minutes; then, for skin exposures rub on a calcium/jelly combination; for eyes flush with a water/calcium solution for 15 minutes.**
- Keep victim warm and quiet. • Keep victim under observation.
- Effects of contact or inhalation may be delayed.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

## HOW TO USE TABLE 1 - INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

- (1) The responder should already have:
  - Identified the material by its ID Number and Name; (if an ID Number cannot be found, use the Name of Material index in the blue-bordered pages to locate that number.)
  - Found the three-digit guide for that material in order to consult the emergency actions recommended jointly with this table;
  - **Noted the wind direction.**
- (2) Look in Table 1 (the green-bordered pages) for the ID Number and Name of the Material involved in the incident. Some ID Numbers have more than one shipping name listed—look for the specific name of the material. (If the shipping name is not known and Table 1 lists more than one name for the same ID Number, use the entry with the largest protective action distances.)
- (3) Determine if the incident involves a SMALL or LARGE spill and if DAY or NIGHT. Generally, a SMALL SPILL is one which involves a single, small package (e.g., a drum containing up to approximately 200 liters), a small cylinder, or a small leak from a large package. A LARGE SPILL is one which involves a spill from a large package, or multiple spills from many small packages. DAY is any time after sunrise and before sunset. NIGHT is any time between sunset and sunrise.

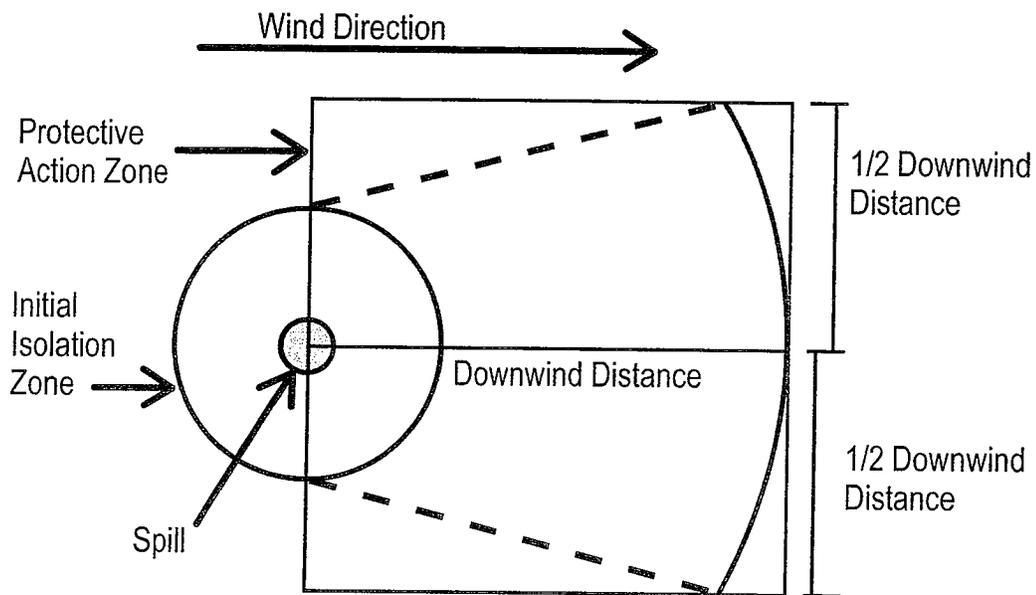
- (4) Look up the INITIAL ISOLATION DISTANCE. Direct all persons to move, in a crosswind direction, away from the spill to the distance specified—in meters and feet.



- (5) Look up the initial PROTECTIVE ACTION DISTANCE shown in Table 1. For a given material, spill size, and whether day or night, Table 1 gives the downwind distance—in kilometers and miles—for which protective actions should be considered. For practical purposes, the Protective Action Zone (i.e., the area in which people are at risk of harmful exposure) is a square, whose length and width are the same as the downwind distance shown in Table 1.

- (6) Initiate Protective Actions to the extent possible, beginning with those closest to the spill site and working away from the site in the downwind direction. When a water-reactive TIH producing material is spilled into a river or stream, the source of the toxic gas may move with the current or stretch from the spill point downstream for a substantial distance.

The shape of the area in which protective actions should be taken (the Protective Action Zone) is shown in this figure. The spill is located at the center of the small circle. The larger circle represents the INITIAL ISOLATION zone around the spill.



**NOTE 1:** See "Introduction To Table 1 - Initial Isolation And Protective Action Distances" for factors which may increase or decrease Protective Action Distances.

**NOTE 2:** See Table 2 – Water-Reactive Materials which Produce Toxic Gases for the list of gases produced when these materials are spilled in water.

Call the emergency response telephone number listed on the shipping paper, or the appropriate response agency as soon as possible for additional information on the material, safety precautions, and mitigation procedures.

**TABLE 1 INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES**

ID No.	NAME OF MATERIAL	SMALL SPILLS (From a small package or small leak from a large package)				LARGE SPILLS (From a large package or from many small packages)			
		First ISOLATE in all Directions Meters (Feet)	Then PROTECT persons Downwind during-		First ISOLATE in all Directions Meters (Feet)	Then PROTECT persons Downwind during-			
			DAY Kilometers (Miles)	NIGHT Kilometers (Miles)		DAY Kilometers (Miles)	NIGHT Kilometers (Miles)		
1005	Ammonia, anhydrous	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.1 mi)	150 m (500 ft)	0.8 km (0.5 mi)	2.3 km (1.4 mi)		
1005	Anhydrous ammonia	30 m (100 ft)	0.1 km (0.1 mi)	0.6 km (0.4 mi)	300 m (1000 ft)	1.9 km (1.2 mi)	4.8 km (3.0 mi)		
1008	Boron trifluoride	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	150 m (500 ft)	0.7 km (0.5 mi)	2.7 km (1.7 mi)		
1008	Boron trifluoride, compressed	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	150 m (500 ft)	0.7 km (0.5 mi)	2.7 km (1.7 mi)		
1016	Carbon monoxide	60 m (200 ft)	0.4 km (0.3 mi)	1.6 km (1.0 mi)	600 m (2000 ft)	3.5 km (2.2 mi)	8.0 km (5.0 mi)		
1016	Carbon monoxide, compressed	30 m (100 ft)	0.1 km (0.1 mi)	0.1 km (0.1 mi)	60 m (200 ft)	0.3 km (0.2 mi)	0.4 km (0.3 mi)		
1017	Chlorine	30 m (100 ft)	0.2 km (0.1 mi)	0.9 km (0.5 mi)	150 m (500 ft)	1.0 km (0.7 mi)	3.5 km (2.2 mi)		
1023	Coal gas	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.1 mi)	150 m (500 ft)	0.8 km (0.5 mi)	2.5 km (1.6 mi)		
1023	Coal gas, compressed	30 m (100 ft)	0.1 km (0.1 mi)	0.2 km (0.1 mi)	150 m (500 ft)	0.8 km (0.5 mi)	2.5 km (1.6 mi)		
1026	Cyanogen	30 m (100 ft)	0.1 km (0.1 mi)	0.3 km (0.2 mi)	150 m (500 ft)	0.8 km (0.5 mi)	3.1 km (1.9 mi)		
1026	Cyanogen gas	30 m (100 ft)	0.1 km (0.1 mi)	0.4 km (0.3 mi)	300 m (1000 ft)	1.5 km (1.0 mi)	4.5 km (2.8 mi)		
1040	Ethylene oxide	30 m (100 ft)	0.1 km (0.1 mi)	0.4 km (0.3 mi)	60 m (200 ft)	0.3 km (0.2 mi)	1.4 km (0.9 mi)		
1040	Ethylene oxide with Nitrogen	30 m (100 ft)	0.1 km (0.1 mi)	0.4 km (0.3 mi)	1000 m (3000 ft)	3.8 km (2.4 mi)	7.2 km (4.5 mi)		
1045	Fluorine	60 m (200 ft)	0.2 km (0.1 mi)	0.6 km (0.4 mi)	400 m (1250 ft)	1.6 km (1.0 mi)	4.1 km (2.5 mi)		
1045	Fluorine, compressed	30 m (100 ft)	0.1 km (0.1 mi)	0.6 km (0.4 mi)	300 m (1000 ft)	1.7 km (1.1 mi)	3.6 km (2.2 mi)		
1048	Hydrogen bromide, anhydrous	30 m (100 ft)	0.1 km (0.1 mi)	0.5 km (0.3 mi)	300 m (1000 ft)	1.5 km (1.0 mi)	4.5 km (2.8 mi)		
1050	Hydrogen chloride, anhydrous	30 m (100 ft)	0.1 km (0.1 mi)	0.4 km (0.3 mi)	60 m (200 ft)	0.3 km (0.2 mi)	1.4 km (0.9 mi)		
1051	AC (when used as a weapon)	100 m (300 ft)	0.3 km (0.2 mi)	1.1 km (0.7 mi)	1000 m (3000 ft)	3.8 km (2.4 mi)	7.2 km (4.5 mi)		
1051	Hydrocyanic acid, aqueous solutions, with more than 20% Hydrogen cyanide	60 m (200 ft)	0.2 km (0.1 mi)	0.6 km (0.4 mi)	400 m (1250 ft)	1.6 km (1.0 mi)	4.1 km (2.5 mi)		
1051	Hydrogen cyanide, anhydrous, stabilized	30 m (100 ft)	0.1 km (0.1 mi)	0.5 km (0.3 mi)	300 m (1000 ft)	1.7 km (1.1 mi)	3.6 km (2.2 mi)		
1051	Hydrogen cyanide, stabilized	30 m (100 ft)	0.1 km (0.1 mi)	0.5 km (0.3 mi)	300 m (1000 ft)	1.7 km (1.1 mi)	3.6 km (2.2 mi)		

## PROTECTIVE CLOTHING

**Street Clothing and Work Uniforms.** These garments, such as uniforms worn by police and emergency medical services personnel, provide almost no protection from the harmful effects of dangerous goods.

**Structural Fire Fighters' Protective Clothing (SFPC).** This category of clothing, often called turnout or bunker gear, means the protective clothing normally worn by fire fighters during structural fire fighting operations. It includes a helmet, coat, pants, boots, gloves and a hood to cover parts of the head not protected by the helmet and facepiece. This clothing must be used with full-facepiece positive pressure self-contained breathing apparatus (SCBA). This protective clothing should, at a minimum, meet the OSHA Fire Brigades Standard (29 CFR 1910.156). Structural fire fighters' protective clothing provides limited protection from heat and cold, but may not provide adequate protection from the harmful vapors or liquids that are encountered during dangerous goods incidents. Each guide includes a statement about the use of SFPC in incidents involving those materials referenced by that guide. Some guides state that SFPC provides limited protection. In those cases, the responder wearing SFPC and SCBA may be able to perform an expedient, that is quick "in-and-out", operation. However, this type of operation can place the responder at risk of exposure, injury or death. The incident commander makes the decision to perform this operation only if an overriding benefit can be gained (i.e., perform an immediate rescue, turn off a valve to control a leak, etc.). The coverall-type protective clothing customarily worn to fight fires in forests or wildlands is **not** SFPC and is not recommended nor referred to elsewhere in this guidebook.

**Positive Pressure Self-Contained Breathing Apparatus (SCBA).** This apparatus provides a constant, positive pressure flow of air within the facepiece, even if one inhales deeply while doing heavy work. Use apparatus certified by NIOSH and the Department of Labor/Mine Safety and Health Administration in accordance with 42 CFR Part 84. Use it in accordance with the requirements for respiratory protection specified in OSHA 29 CFR 1910.134 (Respiratory Protection) and/or 29 CFR 1910.156 (f) (Fire Brigades Standard). Chemical-cartridge respirators or other filtering masks are not acceptable substitutes for positive pressure self-contained breathing apparatus. Demand-type SCBA does not meet the OSHA 29 CFR 1910.156 (f)(1)(i) of the Fire Brigades Standard. If it is suspected that a Chemical Warfare Agent (CW) is involved, the use of NIOSH-certified respirators with CBRN protection are highly recommended.

**Chemical Protective Clothing and Equipment.** Safe use of this type of protective clothing and equipment requires specific skills developed through training and experience. It is generally not available to, or used by, first responders. This type of special clothing may protect against one chemical, yet be readily permeated by chemicals for which it was not designed. Therefore, protective clothing should not be used unless it is compatible with the released material. This type of special clothing offers little or no protection against heat and/or cold. Examples of this type of equipment have been described as (1) Vapor Protective

Suits (NFPA 1991), also known as Totally-Encapsulating Chemical Protective (TECP) Suits or Level A\* protection (OSHA 29 CFR 1910.120, Appendix A & B), and (2) Liquid-Splash Protective Suits (NFPA 1992 & 1993), also known as Level B\* or C\* protection (OSHA 29 CFR 1910.120, Appendix A & B) or suits for chemical/biological terrorism incidents (NFPA 1994), class 1, 2 or 3 Ensembles. No single protective clothing material will protect you from all dangerous goods. Do not assume any protective clothing is resistant to cold and/or heat or flame exposure unless it is so certified by the manufacturer. (NFPA 1991 5-3 Flammability Resistance Test and 5-6 Cold Temperature Performance Test)

\* Consult glossary for additional protection levels under the heading "Protective Clothing".

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 001

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

*Master*

ORDER NO: 325997  
PROD NO : 744672

INTL. URANIUM (USA) CORP.  
6425 SO. HYW. 191

BLANDING ,UT 84511

UNIVAR USA INC.  
6100 CARILLON POINT , KIRKLAND

(425)889-3400  
, WA 98033

----- EMERGENCY ASSISTANCE -----

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL - CHEMTREC  
(800)424-9300

PRODUCT NAME: ANHYDROUS AMMONIA  
MSDS NUMBER: P1043VS  
DATE ISSUED: 09/21/2002  
SUPERSEDES: 12/10/1999  
ISSUED BY: 005350

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MATERIAL SAFETY DATA SHEET

HFA RATING  
HEALTH: 3  
FLAMMABILITY: 1  
REACTIVITY: 0  
OTHER:

PART I WHAT IS THE MATERIAL AND WHAT DO I NEED TO KNOW IN AN EMERGENCY?

PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: ANHYDROUS AMMONIA

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 002

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

PRODUCT USE: FOR GENERAL ANALYTICAL/SYNTHETIC CHEMICAL USES.

DISTRIBUTOR:  
UNIVAR USA  
6100 CARILLON POINT  
KIRKLAND, WA 98033  
425-889-3400

2. COMPOSITION AND INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	MOLE %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
			TWA	STEL	TWA	STEL	IDLH	
			PPM	PPM	PPM	PPM	PPM	PPM
AMMONIA	7664-41-7	99%	25	35	NE	35	300	NIOSH RELS: TWA = 25 STEL = 35 DFG MAKs: TWA = 20 PEAK = 2 MAK 15 MINUTES, AVERAGE VALUE DFG MAK PREGNANCY RISK CLASSIFICATION: C

MAXIMUM IMPURITIES < 1% NONE OF THE TRACE IMPURITIES OF THIS GAS CONTRIBUTE SIGNIFICANTLY TO THE HAZARDS ASSOCIATED WITH THE PRODUCT. ALL HAZARD INFORMATION PERTINENT TO THIS PRODUCT HAS BEEN PROVIDED IN THIS MATERIAL SAFETY DATA SHEET, PER THE REQUIREMENTS OF THE FEDERAL OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION STANDARD (29 CFR 1910.1200), U.S. STATE EQUIVALENT STANDARDS AND CANADIAN WORKPLACE HAZARDOUS MATERIALS IDENTIFICATION SYSTEM STANDARDS (CPR 4).

E = NOT ESTABLISHED. SEE SECTION 16 FOR DEFINITIONS OF TERMS USED. NOTE (1): ALL WHMIS REQUIRED INFORMATION IS INCLUDED IN APPROPRIATE SECTIONS BASED ON THE ANSI Z400.1-1998 FORMAT. THIS GAS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CPR AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: AMMONIA IS A PUNGENT-SMELLING, TOXIC, CORROSIVE, NON-FLAMMABLE GAS HAVING A SUFFOCATING ODOR. AMMONIA IS SHIPPED BOTH AS A GAS AND LIQUEFIED GAS UNDER ITS OWN VAPOR PRESSURE. THE GAS CAN BURN AND DAMAGE EYES, SKIN, MUCOUS MEMBRANES, AND ANY OTHER EXPOSED TISSUE. INHALATION CAN CAUSE COUGHING AND BREATHING DIFFICULTY. OVEREXPOSURE TO THIS GAS MAY BE FATAL. CONTACT WITH RAPIDLY EXPANDING GASES, OR CONTACT WITH THE LIQUID, MAY

REPORT NUMBER: 703

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 003

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

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CAUSE FROSTBITE. THIS GAS IS LIGHTER THAN AIR AND CAN ACCUMULATE IN HIGH SPACES. (CONTINUED ON FOLLOWING PAGE)

ALTHOUGH LABELED AS A NON-FLAMMABLE GAS, IT CAN BURN. AMMONIA IS NOT READILY IGNITED, BUT EXPLOSIONS OF AMMONIA IN CONFINED SPACES HAVE BEEN REPORTED. VAPOR CLOUDS OF THE GAS MAY BE CONTROLLED USING A WATER FOG. IF INVOLVED IN A FIRE, AMMONIA CAN DECOMPOSE, FORMING VERY FLAMMABLE HYDROGEN AND TOXIC NITROGEN DIOXIDE. PERSONS WHO RESPOND TO RELEASES OF AMMONIA MUST PROTECT THEMSELVES FROM INHALATION OF THE AMMONIA GASES AND MISTS, ESPECIALLY IN AREAS WHICH ARE DOWNWIND OF THE RELEASE. EXTREME CAUTION MUST BE USED WHEN RESPONDING TO RELEASES.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE:  
THE MOST SIGNIFICANT ROUTE OF OVEREXPOSURE FOR THIS GAS IS BY INHALATION. THE FOLLOWING PARAGRAPHS DESCRIBE SYMPTOMS OF EXPOSURE BY ROUTE OF EXPOSURE.

INHALATION: INHALATION OF AMMONIA VAPORS MAY LEAD TO IRRITATION OF THE NOSE AND THROAT. EXPOSURES TO HIGH CONCENTRATIONS OF AMMONIA GAS CAN LEAD TO SYMPTOMS SUCH AS COUGHING, LABORED BREATHING, SORE THROAT, AND IN SOME INSTANCES, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA. HIGH CONCENTRATIONS OF AMMONIA GAS MAY CAUSE AN OXYGEN DEFICIENT ATMOSPHERE. EXPOSURE TO HIGH CONCENTRATIONS MAY CAUSE UNCONSCIOUSNESS, AND UNDER SOME CIRCUMSTANCES, DEATH. EXPOSURE TO THE EYES MAY CAUSE TEMPORARY BLINDNESS, LEADING TO PERMANENT VISION IMPAIRMENT.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH HAZARD (BLUE) = 3  
FLAMMABILITY HAZARD (RED) = 1  
PHYSICAL HAZARD (YELLOW) = 0  
PROTECTIVE EQUIPMENT = H

RESPIRATORY AND BODY: SEE SECTION 8  
FOR ROUTINE INDUSTRIAL USE AND HANDLING APPLICATIONS

REPEATED AMMONIA OVEREXPOSURES BY INHALATION CAN RESULT IN EMPHYSEMA. THE SYMPTOMS ASSOCIATED WITH SPECIFIC AMMONIA CONCENTRATIONS ARE AS FOLLOWS:

CONCENTRATION	SYMPTOM(S)
0.6 - 53 PPM	ODOR THRESHOLD.
25 - 50 PPM	IRRITATION OF THE EYES AND MUCOUS MEMBRANES, WHICH CAN BE TOLERATED FOR SEVERAL HOURS.
100 - 150 PPM	IMMEDIATE IRRITATION OF THE THROAT, WHICH MAY BE TOLERATED FOR AN HOUR.
400 - 700 PPM	IMMEDIATE, SEVERE IRRITATION OF THE RESPIRATORY SYSTEM AND EYES OCCURS.
1000 PPM	THIS LEVEL OF EXPOSURE MAY RESULT IN RAPID DEATH DUE TO SUFFOCATION OR FLUID IN THE LUNGS. EXPOSURE TO CONCENTRATIONS IN EXCESS OF 5000 PPM MAY CAUSE

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 004

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

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LARYNGEAL SPASMS, RESULTING IN DEATH.  
CONTACT WITH LIQUID AMMONIA MAY CAUSE IMMEDIATE, SEVERE CHEMICAL BURNS AS WELL AS FROSTBITE, AND ALL OF THE SYMPTOMS DESCRIBED FOR OVEREXPOSURE TO THE GAS.

CONTACT WITH SKIN OR EYES: CONTACT OF THE LIQUID (OR GASEOUS PRODUCT OR THE MIST PRODUCED BY AMMONIA), WITH THE SKIN CAN LEAD TO SEVERE BURNS OR DERMATITIS (RED, CRACKED, IRRITATED SKIN), DEPENDING UPON CONCENTRATION AND DURATION OF EXPOSURE. HIGH LEVELS OF AIRBORNE AMMONIA GAS DISSOLVE IN MOISTURE ON THE SKIN, FORMING CORROSIVE AMMONIUM HYDROXIDE. AT 10,000 PPM, AMMONIA IS MILDLY IRRITATING TO MOIST SKIN. AT 20,000 PPM, THE EFFECTS ARE MORE PRONOUNCED AND 30000 PPM MAY PRODUCE CHEMICAL BURNS WITH BLISTERING. CONTACT OF THE LIQUID (OR GASEOUS PRODUCT OR THE MIST PRODUCED BY AMMONIA), WITH THE EYES CAN CAUSE PAIN, REDNESS, AND PROLONGED EXPOSURE COULD CAUSE BLINDNESS. CONTACT WITH THE UNDILUTED LIQUID WILL CAUSE FROSTBITE, ULCERATION OF THE SKIN (WHICH MAY BE DELAYED IN APPEARANCE FOR SEVERAL HOURS), BLISTERING, AND PAIN.

OTHER POTENTIAL HEALTH EFFECTS: WHILE INGESTION IS HIGHLY UNLIKELY, INGESTION OF AMMONIA CAN DAMAGE THE TISSUES OF THE MOUTH, THROAT, ESOPHAGUS, AND OTHER TISSUES OF THE DIGESTIVE SYSTEM. INGESTION OF AMMONIA CAN BE FATAL. ADDITIONALLY, ASPIRATION BY INHALATION IS POSSIBLE, CAUSING CHEMICAL PNEUMONIA OR DEATH. CONTACT WITH LIQUID AMMONIA OR RAPIDLY EXPANDING GASES (WHICH ARE RELEASED UNDER HIGH PRESSURE) MAY CAUSE FROSTBITE. SYMPTOMS OF FROSTBITE INCLUDE CHANGE IN SKIN COLOR TO WHITE OR GRAYISH-YELLOW. THE PAIN AFTER CONTACT WITH RAPIDLY EXPANDING GASES CAN QUICKLY SUBSIDE.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: AN EXPLANATION IN LAY TERMS.  
OVEREXPOSURE TO AMMONIA MAY CAUSE THE FOLLOWING HEALTH EFFECTS:  
ACUTE: THIS GAS IS EXTREMELY CORROSIVE, AND CAN BURN AND DAMAGE EYES, SKIN, MUCOUS MEMBRANES, AND ANY OTHER EXPOSED TISSUE. IF INHALED, IRRITATION OF THE RESPIRATORY SYSTEM MAY OCCUR, WITH COUGHING, AND BREATHING DIFFICULTY. OVEREXPOSURE TO THIS GAS MAY BE FATAL. THOUGH UNLIKELY TO OCCUR DURING OCCUPATIONAL USE, INGESTION OF LARGE QUANTITIES MAY BE FATAL.

CHRONIC: PERSISTENT IRRITATION MAY RESULT FROM REPEATED EXPOSURES TO THIS GAS. REPEATED AMMONIA OVEREXPOSURES BY INHALATION CAN RESULT IN EMPHYSEMA. SEE SECTION 11 (TOXICOLOGICAL INFORMATION) FOR ADDITIONAL INFORMATION.

TARGET ORGANS: ACUTE: RESPIRATORY SYSTEM, SKIN, EYES.

CHRONIC: SKIN, RESPIRATORY SYSTEM.

PART II WHAT SHOULD I DO IF A HAZARDOUS SITUATION OCCURS?

FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO AMMONIA

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 005

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

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WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. AT A MINIMUM, SELF-CONTAINED BREATHING APPARATUS PERSONAL PROTECTIVE EQUIPMENT SHOULD BE WORN. IF NECESSARY, FIRE PROTECTION SHOULD BE PROVIDED. REMOVE VICTIM(S) TO A SAFE LOCATION. TRAINED PERSONNEL SHOULD ADMINISTER SUPPLEMENTAL OXYGEN AND/OR CARDIO-PULMONARY RESUSCITATION, IF NECESSARY. VICTIM(S) MUST BE TAKEN FOR MEDICAL ATTENTION. RESCUERS SHOULD BE TAKEN FOR MEDICAL ATTENTION, IF NECESSARY. TAKE COPY OF LABEL AND MSDS TO PHYSICIAN OR OTHER HEALTH PROFESSIONAL WITH VICTIM(S). REFER TO "RECOMMENDATIONS TO PHYSICIANS," BELOW FOR ADDITIONAL INFORMATION ON FIRST-AID MEASURES.

IN CASE OF FROSTBITE, PLACE THE FROSTBITTEN PART IN WARM WATER. DO NOT USE HOT WATER. IF WARM WATER IS NOT AVAILABLE, OR IS IMPRACTICAL TO USE, WRAP THE AFFECTED PARTS GENTLY IN BLANKETS. ALTERNATIVELY, IF THE FINGERS OR HANDS ARE FROSTBITTEN, PLACE THE AFFECTED AREA OF THE BODY IN THE ARMPIT. ENCOURAGE VICTIM TO GENTLY EXERCISE THE AFFECTED PART WHILE BEING WARMED. SEEK IMMEDIATE MEDICAL ATTENTION.

SKIN EXPOSURE: IF AMMONIA CONTAMINATES THE SKIN, IMMEDIATELY BEGIN DECONTAMINATION WITH RUNNING WATER. MINIMUM FLUSHING IS FOR 15 MINUTES. REMOVE EXPOSED OR CONTAMINATED CLOTHING, TAKING CARE NOT TO CONTAMINATE EYES. VICTIM MUST SEEK IMMEDIATE MEDICAL ATTENTION. SEEK IMMEDIATE MEDICAL ATTENTION.

EYE EXPOSURE: IF LIQUID IS SPLASHED INTO EYES, OR IF IRRITATION OF THE EYE DEVELOPS AFTER EXPOSURE TO LIQUID OR GAS, OPEN VICTIM'S EYES WHILE UNDER GENTLE RUNNING WATER. USE SUFFICIENT FORCE TO OPEN EYELIDS. HAVE VICTIM "ROLL" EYES. MINIMUM FLUSHING IS FOR 15 MINUTES.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: CONDITIONS RELATING TO THE TARGET ORGANS MAY BE AGGRAVATED BY OVEREXPOSURES TO AMMONIA. SEE SECTION 3 (HAZARD IDENTIFICATION) FOR INFORMATION ON THESE CONDITIONS.

RECOMMENDATIONS TO PHYSICIANS: TREAT SYMPTOMS, ADMINISTER LUNG FUNCTION TESTS AND POSSIBLE CHEST X-RAYS. REDUCE OVEREXPOSURE. DELAYED PULMONARY EDEMA MAY OCCUR, FOLLOWING OVEREXPOSURE BY INHALATION. BASIC TREATMENT: ESTABLISH A PATENT AIRWAY. SUCTION IF NECESSARY. WATCH FOR SIGNS OF RESPIRATORY INSUFFICIENCY AND ASSIST VENTILATIONS IF NECESSARY. ADMINISTER OXYGEN BY NON-REBREATHING MASK AT 10 TO 15 L/MINUTES. MONITOR FOR SIGNS OF PULMONARY EDEMA AND TREAT IF NECESSARY. MONITOR FOR SHOCK AND TREAT IF NECESSARY. FOR EYE CONTAMINATION, FLUSH EYES IMMEDIATELY WITH WATER. IRRIGATE EACH EYE CONTINUOUSLY WITH NORMAL SALINE DURING TRANSPORT. DO NOT USE EMETICS. FOR INGESTION, RINSE MOUTH AND ADMINISTER 5 ML/KG UP TO 200 ML OF WATER FOR DILUTION IF THE PATIENT CAN SWALLOW, HAS A STRONG GAG REFLEX, AND DOES NOT VOMIT. DO NOT ATTEMPT TO NEUTRALIZE.

FIRE-FIGHTING MEASURES

FLASH POINT: NO FLASH POINT DETERMINED IN CONVENTIONAL CLOSED CUP TESTS.

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 006

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

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AMMONIA CAN BE IGNITED.

NFPA

HEALTH: 3

FLAMMABILITY: 1

REACTIVITY: 0

OTHER:

SEE SECTION 16 FOR DEFINITION OF RATINGS

AUTOIGNITION TEMPERATURE: 651 DEG C (1204 DEG F)

MINIMUM IGNITION ENERGY: 680 MILLIJOULES

FLAMMABLE LIMITS (IN AIR BY VOLUME, %):

LOWER (LEL): 15.0%

UPPER (UEL): 28.0%

FIRE EXTINGUISHING MATERIALS:

WATER SPRAY: YES CARBON DIOXIDE: YES

HALON: YES FOAM: YES

DRY CHEMICAL: YES OTHER: ANY "ABC" CLASS.

USUAL FIRE AND EXPLOSION HAZARDS: AMMONIA IS A TOXIC, CORROSIVE GAS AND PRESENTS AN EXTREME HAZARD TO FIREFIGHTERS. IN THE EVENT OF FIRE, COOL CONTAINERS OF AMMONIA WITH WATER TO PREVENT FAILURE. USE A WATER SPRAY OR FOG TO REDUCE OR DIRECT VAPORS. DO NOT DIRECT A WATER SPRAY AT THE SOURCE OF A RELEASE. THIS GAS MAY IGNITE EXPLOSIVELY, IF RELEASED NEAR AN ACTIVE FIRE. AMMONIA IS LIGHTER THAN AIR, BUT CONDITIONS ASSOCIATED WITH A RELEASE CAN CAUSE IT TO ACCUMULATE IN LOW-LYING AREAS. THE EXPLOSIVE RANGE IS BROADENED TO 15 TO 79% BY MIXING WITH COMBUSTIBLE OR FLAMMABLE GASES (SUCH AS HYDROGEN), AND BY HIGHER TEMPERATURES AND PRESSURES. THE PRESENCE OF OIL OR COMBUSTIBLE MATERIALS INCREASES THE FIRE HAZARD AND THE PRESENCE OF IRON LOWERS THE IGNITION TEMPERATURE FROM 850- 651 DEG C (1652-1203.8 DEG F). AMMONIA DECOMPOSES INTO FLAMMABLE HYDROGEN GAS AT ABOUT 450-500 DEG C (842-932 DEG F). TOXIC AND IRRITATING NITROGEN DIOXIDE CAN FORM DURING BURNING IN AIR. CONTAINERS OR CYLINDERS MAY RUPTURE VIOLENTLY DUE TO OVER-PRESSURIZATION, IF EXPOSED TO FIRE OR EXCESSIVE HEAT FOR A SUFFICIENT PERIOD OF TIME, RELEASING FLAMMABLE AND TOXIC GASES.

EXPLOSION SENSITIVITY TO MECHANICAL IMPACT: NOT SENSITIVE.

EXPLOSION SENSITIVITY TO STATIC DISCHARGE: THERE IS INSUFFICIENT INFORMATION TO CLASSIFY AMMONIA GAS AS TO ITS SENSITIVITY TO STATIC DISCHARGE. LIQUEFIED AMMONIA WILL NOT ACCUMULATE STATIC CHARGE, SINCE THE ELECTRICAL CONDUCTIVITY IS HIGH.

SPECIAL FIRE-FIGHTING PROCEDURES: INCIPIENT FIRE RESPONDERS SHOULD WEAR EYE PROTECTION. STRUCTURAL FIREFIGHTERS MUST WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE EQUIPMENT. MOVE FIRE-EXPOSED CYLINDERS IF IT CAN BE DONE WITHOUT RISK TO FIREFIGHTERS. OTHERWISE, COOL CONTAINERS WITH

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 007

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

HOSE STREAM AND PROTECT PERSONNEL. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUNDS FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF TANKS DUE TO THE FIRE. IF AMMONIA IS INVOLVED IN A FIRE, FIRE RUNOFF WATER SHOULD BE CONTAINED TO PREVENT POSSIBLE ENVIRONMENTAL DAMAGE.

#### 6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: UNCONTROLLED RELEASES SHOULD BE RESPONDED TO BY TRAINED PERSONNEL USING PRE-PLANNED PROCEDURES. PROPER PROTECTIVE EQUIPMENT SHOULD BE USED. IN CASE OF A LARGE RELEASE, CLEAR THE AFFECTED AREA, PROTECT PEOPLE, AND RESPOND WITH TRAINED PERSONNEL. IF POSSIBLE STOP THE GAS FLOW AT THE SOURCE. A WATER FOG OR MIST CAN BE USED TO CONTROL THE VAPOR CLOUD RESULTING FROM THE RELEASE. ELIMINATE SOURCES OF IGNITION. SUPPLY MAXIMUM POSSIBLE VENTILATION WITH EXPLOSION-PROOF EQUIPMENT. MINIMUM PERSONAL PROTECTIVE EQUIPMENT SHOULD BE LEVEL A: TRIPLE-GLOVES (NEOPRENE RUBBER GLOVES AND NITRILE GLOVES, OVER LATEX OR N-DEX GLOVES), FULLY-ENCAPSULATING CHEMICAL RESISTANT SUIT AND BOOTS, HARD-HAT, AND SELF CONTAINED BREATHING APPARATUS. LARGE RELEASES OF AMMONIA WILL BE EVIDENT BY THE CLOUD OF AMMONIA HYDROXIDE MIST WHICH IS FORMED. SMALL RELEASES OF AMMONIA CAN BE DETECTED BY MEANS OF AN ATOMIZER OR SQUEEZE BOTTLE FILLED WITH CONCENTRATED HYDROCHLORIC ACID, WHERE A WHITE CLOUD WILL SHOW THE LOCATION OF THE LEAK, OR WITH WET PH PAPER, WHICH WILL TURN BLUE. ATTEMPT TO CLOSE THE MAIN SOURCE VALVE PRIOR TO ENTERING THE AREA. IF THIS DOES NOT STOP THE RELEASE (OR IT IS NOT POSSIBLE TO REACH THE VALVE), ALLOW THE GAS TO RELEASE IN PLACE OR REMOVE IT TO A SAFE AREA AND ALLOW THE GAS TO BE RELEASED THERE. MONITOR THE SURROUNDING AREA FOR AMMONIA GAS AND OXYGEN LEVELS. THE AMMONIA LEVEL MUST BE BELOW 25 PPM AND THE ATMOSPHERE MUST HAVE AT LEAST 19.5 PERCENT OXYGEN BEFORE PERSONNEL CAN BE ALLOWED IN THE AREA WITHOUT SELF-CONTAINED BREATHING APPARATUS.

THIS IS A CORROSIVE GAS. PROTECTION OF ALL PERSONNEL AND THE AREA MUST BE MAINTAINED. ALL RESPONDERS MUST BE ADEQUATELY PROTECTED FROM EXPOSURE.

#### PART III HOW CAN I PREVENT HAZARDOUS SITUATIONS FROM OCCURRING?

##### HANDLING AND STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: AS WITH ALL CHEMICALS, AVOID GETTING AMMONIA ON YOU OR IN YOU. WASH HANDS AFTER HANDLING CHEMICALS. DO NOT EAT OR DRINK WHILE HANDLING CHEMICALS. ALL WORK PRACTICES SHOULD MINIMIZE THE RELEASE OF AMMONIA. BE AWARE OF ANY SIGNS OF EFFECTS OF EXPOSURE INDICATED IN SECTION 3 (HAZARD IDENTIFICATION); EXPOSURES TO FATAL CONCENTRATIONS OF AMMONIA COULD OCCUR RAPIDLY.

STORAGE AND HANDLING PRACTICES: ALL EMPLOYEES WHO HANDLE THIS MATERIAL SHOULD BE TRAINED TO HANDLE IT SAFELY. AVOID BREATHING THE GAS OR SPRAYS OR MISTS GENERATED BY AMMONIA. STORE CONTAINERS IN A COOL, DRY LOCATION, AWAY FROM DIRECT SUNLIGHT, SOURCES OF INTENSE HEAT, OR WHERE FREEZING IS POSSIBLE. USE ONLY COMPATIBLE MATERIALS FOR CYLINDERS, PROCESS LINES, AND OTHER AMMONIA-

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 008

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

HANDLING EQUIPMENT. LINES SHOULD BE PURGED WITH DRY NITROGEN BOTH BEFORE AND AFTER MAINTENANCE ACTIVITY. COPPER, TIN, ZINC AND THEIR ALLOYS ARE NOT SUITABLE MATERIALS FOR USE WITH AMMONIA. KEEP CONTAINER TIGHTLY-CLOSED WHEN NOT IN USE. KEEP CYLINDERS AWAY FROM INCOMPATIBLE MATERIAL. WASH THOROUGHLY AFTER USING THIS MATERIAL. WORKERS MUST BE THOROUGHLY TRAINED TO HANDLE AMMONIA WITHOUT CAUSING OVEREXPOSURE. PERIODIC INSPECTIONS OF PROCESS EQUIPMENT BY KNOWLEDGEABLE PERSONS SHOULD BE MADE TO ENSURE THAT THE EQUIPMENT IS USED APPROPRIATELY AND THE SYSTEM IS KEPT IN SUITABLE OPERATING CONDITION. AMMONIA EMERGENCY EQUIPMENT SHOULD BE AVAILABLE NEAR THE POINT OF USE.

WORKERS WHO HANDLE AMMONIA SHOULD WEAR PROTECTIVE CLOTHING, AS LISTED IN SECTION 8 (EXPOSURE CONTROLS -PERSONAL PROTECTION). INSTANT-ACTING SHOWERS SHOULD BE AVAILABLE IN THE EVENT OF AN EMERGENCY. SPECIAL EYE-WASH FOUNTAINS OR SIMILAR EQUIPMENT SHOULD BE AVAILABLE FOR EYE IRRIGATION.

PROPER RESPIRATORY PROTECTION EQUIPMENT MUST BE PROVIDED AND WORKERS USING SUCH EQUIPMENT MUST BE CAREFULLY TRAINED IN ITS OPERATION AND LIMITATIONS. PRECAUTIONS MUST ALWAYS BE TAKEN TO PREVENT SUCK-BACK OF FOREIGN MATERIALS INTO THE CYLINDER BY USING A CHECK-VALVE, VACUUM BREAK, OR TRAP, SINCE SUCK-BACK MAY CAUSE DANGEROUS PRESSURE CHANGES WITHIN THE CYLINDER. THE CYLINDER VALVE SHOULD BE CLOSED AFTER EACH USE. DETERMINE CYLINDER CONTENTS BY WEIGHT. THE TARE WEIGHT OF THE CYLINDER IS STAMPED ON THE CYLINDER.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: PROTECT CYLINDERS AGAINST PHYSICAL DAMAGE. STORE IN COOL, DRY, WELL-VENTILATED AREA, AWAY FROM SOURCES OF HEAT, IGNITION AND DIRECT SUNLIGHT. DO NOT ALLOW AREA WHERE CYLINDERS ARE STORED TO EXCEED 52 DEG C (125 DEG F). ISOLATE FROM INCOMPATIBLE MATERIALS (SEE SECTION 10, STABILITY AND REACTIVITY) FOR MORE INFORMATION). USE A CHECK VALVE OR TRAP IN THE DISCHARGE LINE TO PREVENT HAZARDOUS BACKFLOW. NEVER EQUIP WITH PRESSURE RELIEF DEVICES IN VALVES AND CYLINDERS. ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING OR EXPLOSION PROOF.

THE FOLLOWING RULES ARE APPLICABLE TO WORK SITUATIONS IN WHICH CYLINDERS ARE BEING USED :

BEFORE USE: MOVE CYLINDERS WITH SUITABLE HAND-TRUCK. SECURE CYLINDERS FIRMLY. LEAVE THE VALVE PROTECTION CAP IN PLACE UNTIL CYLINDER IS READY FOR USE.

URING USE: USE DESIGNATED REGULATORS, CGA FITTINGS, AND OTHER SUPPORT EQUIPMENT. DO NOT USE ADAPTERS. DO NOT USE OIL OR GREASE ON GAS HANDLING FITTINGS OR EQUIPMENT. ALL EQUIPMENT MUST BE PROPERLY GROUNDED AND BONDED.

AMMONIA CYLINDERS SHOULD NEVER BE DIRECTLY CONNECTED TO A VESSEL CONTAINING A LIQUID SINCE SUCK-BACK MAY OCCUR CAUSING A VIOLENT REACTION WITHIN THE CYLINDER. TO PREVENT SUCK-BACK, A TRAP, CHECK VALVE OR VACUUM BREAK SHOULD BE

INSERTED INTO THE LINE. THE TRAP SHOULD BE OF ADEQUATE SIZE TO TAKE THE TOTAL LIQUID VOLUME SUCKED-BACK. THE RATE OF GAS FLOW CAN BE INCREASED BY IMPROVING

CIRCULATION ABOUT THE CONTAINER OR BY INCREASING THE TEMPERATURE OF THE LIQUID IF IT IS BELOW NORMAL. NEVER APPLY HEAT DIRECTLY TO THE CYLINDER FOR ANY

REASON. DO NOT MANIFOLD CYLINDERS TO INCREASE OUTPUT UNLESS CHECK VALVES HAVE

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 009

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

-----  
BEEN INSERTED AT THE CYLINDER OUTPUTS TO PREVENT EXCHANGE OF MATERIAL FROM ONE CYLINDER TO ANOTHER, CAUSING A CYLINDER TO BECOME OVER-FULL.

HOISTING OF CYLINDERS IS NOT RECOMMENDED. IF HOISTING CANNOT BE AVOIDED, ALWAYS USE A LIFTING CLAMP, CRADLE, OR CARRIER -- NEVER USE A LIFTING MAGNET, ROPE, OR CHAIN SPRING. DO NOT STORE AMMONIA CYLINDERS NEAR CYLINDERS OF HYDROGEN, ACETYLENE, FUEL GASES, ETHER, TURPENTINE, HYDROCARBONS, ORGANIC MATTER, OR FINELY-DIVIDED METALS. NEVER MIX AMMONIA WITH OTHER GASES IN THE CYLINDER. DO NOT STORE AMMONIA CYLINDERS NEAR ELEVATORS OR GANGWAYS OR IN LOCATIONS WHERE HEAVY OBJECTS MAY FALL AND STRIKE THEM.

OPEN CYLINDER VALVES SLOWLY. THE USE OF LARGE WRENCHES OR PIPE WRENCHES WILL DAMAGE THE VALVE. ONE COMPLETE TURN OF THE VALVE STEM IN A COUNTER-CLOCKWISE DIRECTION OPENS THE VALVE SUFFICIENTLY TO PERMIT MAXIMUM DISCHARGE. "EMPTY" CONTAINERS STILL CONTAIN AMMONIA GAS, AND SHOULD BE HANDLED WITH ALL PRECAUTIONS DESCRIBED IN THIS MSDS. IF LEAKS DEVELOP IN AMMONIA LINES, THEY MUST BE GIVEN PROMPT ATTENTION BECAUSE THEY WILL BECOME PROGRESSIVELY WORSE. REFER TO SECTION 6 (ACCIDENTAL RELEASE MEASURES) FOR RELEASE RESPONSE PROTOCOL.

BEFORE USE: CLOSE MAIN CYLINDER VALVE. REPLACE VALVE PROTECTION CAP (WHERE PROVIDED). MARK EMPTY CYLINDERS "EMPTY".

NOTE: USE ONLY DOT OR ASME CODE CONTAINERS DESIGNED FOR STORAGE. EARTH-GROUND AND BOND ALL LINES AND EQUIPMENT ASSOCIATED WITH AMMONIA. CLOSE VALVE AFTER EACH USE AND WHEN EMPTY. CYLINDERS MUST NOT BE RECHARGED EXCEPT BY OR WITH THE CONSENT OF OWNER. FOR ADDITIONAL INFORMATION REFER TO THE COMPRESSED GAS ASSOCIATION PAMPHLET P-1, SAFE HANDLING OF COMPRESSED GASES IN CONTAINERS. ADDITIONALLY, REFER TO CGA BULLETIN SB-2 "OXYGEN DEFICIENT ATMOSPHERES" AND NFPA BULLETIN 58.

TANK CAR SHIPMENTS: TANK CARS CARRYING AMMONIA SHOULD BE LOADED AND UNLOADED IN STRICT ACCORDANCE WITH TANK-CAR MANUFACTURER'S RECOMMENDATIONS AND ALL ESTABLISHED ON-SITE SAFETY PROCEDURES. APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE USED DURING TANK CAR OPERATIONS (SEE SECTION 8). ALL LOADING AND UNLOADING EQUIPMENT MUST BE INSPECTED, PRIOR TO EACH USE. LOADING AND UNLOADING OPERATIONS MUST BE ATTENDED, AT ALL TIMES. TANK CARS MUST BE LEVEL AND WHEELS MUST BE LOCKED OR BLOCKED PRIOR TO LOADING OR UNLOADING. TANK CAR (FOR LOADING) OR STORAGE TANK (FOR UNLOADING) MUST BE VERIFIED TO BE CORRECT FOR RECEIVING AMMONIA AND BE PROPERLY PREPARED, PRIOR TO STARTING THE TRANSFER OPERATIONS. HOSES MUST BE VERIFIED TO BE CLEAN AND FREE OF INCOMPATIBLE CHEMICALS, PRIOR TO CONNECTION TO THE TANK CAR OR VESSEL. VALVES AND HOSES MUST BE VERIFIED TO BE IN THE CORRECT POSITIONS, BEFORE STARTING TRANSFER OPERATIONS. A SAMPLE (IF REQUIRED) MUST BE TAKEN AND VERIFIED (IF REQUIRED) PRIOR TO STARTING TRANSFER OPERATIONS. ALL LINES MUST BE BLOWN-DOWN AND PURGED BEFORE DISCONNECTING THEM FROM THE TANK CAR OR VESSEL.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: FOLLOW

REPORT NUMBER: 703

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 010

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

-----  
PRACTICES INDICATED IN SECTION 6 (ACCIDENTAL RELEASE MEASURES). MAKE CERTAIN APPLICATION EQUIPMENT IS LOCKED AND TAGGED-OUT SAFELY. PURGE GAS HANDLING EQUIPMENT WITH INERT GAS (E.G., NITROGEN) BEFORE ATTEMPTING REPAIRS.

#### 8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: USE WITH ADEQUATE VENTILATION. A HOOD WITH FORCED VENTILATION IS PREFERABLE. BECAUSE OF THE HIGH HAZARD ASSOCIATED WITH AMMONIA, STRINGENT CONTROL MEASURES SUCH AS A GAS CABINET ENCLOSURE OR ISOLATION MAY BE NECESSARY. DUCTWORK SHOULD BE CONSTRUCTED OF NON-METALLIC MATERIAL, OR SHOULD BE LINED TO RESIST CORROSION. IF NECESSARY, INSTALL AUTOMATIC MONITORING DEVICES FOR AMMONIA AND OXYGEN.

RESPIRATORY PROTECTION: MAINTAIN AIRBORNE CONTAMINANT CONCENTRATIONS BELOW EXPOSURE LIMITS LISTED IN SECTION 2 (COMPOSITION AND INFORMATION ON INGREDIENTS). IF RESPIRATORY PROTECTION IS NEEDED, USE ONLY PROTECTION AUTHORIZED IN THE U.S. FEDERAL OSHA STANDARD (29 CFR 1910.134), APPLICABLE U.S. STATE REGULATIONS, OR THE CANADIAN CSA STANDARD Z94.4-93 AND APPLICABLE STANDARDS OF CANADIAN PROVINCES. OXYGEN LEVELS BELOW 19.5% ARE CONSIDERED IDLH BY OSHA. IN SUCH ATMOSPHERES, USE OF A FULL-FACEPIECE PRESSURE/DEMAND SUPPLY OR A FULL FACEPIECE, SUPPLIED AIR RESPIRATOR WITH AUXILIARY SELF-CONTAINED AIR SUPPLY IS REQUIRED UNDER OSHA'S RESPIRATORY PROTECTION STANDARD (1910.134-1998). THE FOLLOWING NIOSH RESPIRATORY PROTECTION RECOMMENDATIONS FOR AMMONIA ARE PROVIDED FOR ADDITIONAL INFORMATION.

CONCENTRATION	RESPIRATORY EQUIPMENT
UP TO 250 PPM:	CHEMICAL CARTRIDGE RESPIRATOR OR SUPPLIED AIR RESPIRATOR (SAR).
UP TO 300 PPM:	SAR IN THE CONTINUOUS FLOW MODE, OR A POWERED AIR PURIFYING RESPIRATOR (PAPR) WITH AMMONIA CARTRIDGES, OR FULL-FACEPIECE CHEMICAL CARTRIDGE RESPIRATOR WITH AMMONIA CARTRIDGE, OR A GAS MASK WITH AN AMMONIA CANISTER, OR FULL-FACEPIECE SELF-CONTAINED BREATHING APPARATUS (SCBA), OR FULL-FACEPIECE SAR.

NIOSH RESPIRATORY PROTECTION RECOMMENDATIONS FOR AMMONIA IN

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATION OR IDLH CONDITIONS: POSITIVE PRESSURE, FULL-FACEPIECE SCBA OR POSITIVE PRESSURE, FULL-FACEPIECE SAR WITH AN AUXILIARY POSITIVE PRESSURE SCBA.

ESCAPE: GAS MASK WITH CANISTER TO PROTECT AGAINST AMMONIA OR ESCAPE-TYPE SCBA

EYE PROTECTION: SPLASH GOGGLES OR SAFETY GLASSES AND FACE SHIELD. IF NECESSARY, REFER TO U.S. OSHA 29 CFR 1910.133, OR CANADIAN STANDARDS.

HAND PROTECTION: WEAR MECHANICAL RESISTANT GLOVES WHEN HANDLING CYLINDERS OF AMMONIA. WEAR NEOPRENE GLOVES FOR INDUSTRIAL USE. USE TRIPLE GLOVES FOR SPILL RESPONSE (SEE SECTION 6 ACCIDENTAL RELEASE MEASURES). IF NECESSARY, REFER TO U.S. OSHA 29 CFR 1910.138 OR APPROPRIATE STANDARDS OF CANADA.

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 011

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

-----  
PROTECTION FOR TANK CAR OPERATIONS: SPLASH-SUIT, GLOVES, GOGGLES, FACE-SHIELD, BOOTS AND HARD-HAT SHOULD BE WORN DURING OPERATIONS INVOLVING TANK-CARS OR TRUCKS CONTAINING AMMONIA.

BODY PROTECTION: USE BODY PROTECTION APPROPRIATE FOR TASK. TRANSFER OF LARGE QUANTITIES UNDER PRESSURE MAY REQUIRE PROTECTIVE EQUIPMENT APPROPRIATE TO PROTECT EMPLOYEES FROM SPLASHES OF LIQUEFIED PRODUCT, AS WELL PROVIDE SUFFICIENT INSULATION FROM EXTREME COLD. IF A HAZARD OF INJURY TO THE FEET EXISTS DUE TO FALLING OBJECTS, ROLLING OBJECTS, WHERE OBJECTS MAY PIERCE THE SOLES OF THE FEET OR WHERE EMPLOYEE'S FEET MAY BE EXPOSED TO ELECTRICAL HAZARDS, USE FOOT PROTECTION, AS DESCRIBED IN U.S. OSHA 29 CFR.

#### 9. PHYSICAL AND CHEMICAL PROPERTIES

VAPOR DENSITY @32 DEG F:	0.77 KG/M3 (0.048 IB/FT3)
EVAPORATION RATE (NBUAC = 1):	NOT APPLICABLE.
SPECIFIC GRAVITY (AIR = 1):	0.594
FREEZING POINT:	-77 DEG C (-107 DEG F)
SOLUBILITY IN WATER:	84%
FREEZING POINT A 1 ATM:	-33.4 DEG C (-28.2 DEG F)
ODOR THRESHOLD:	0.6 - 53 PPM (DETECTION)
VAPOR PRESSURE (PSIA):	128.8
SPECIFIC VOLUME (FT3/LB):	22.6
EXPANSION RATIO:	NOT APPLICABLE.
PH:	NOT APPLICABLE. (A 1% SOLUTION IN WATER WILL HAVE A PH > 13)

EFFICIENT WATER/OIL DISTRIBUTION: NOT DETERMINED.

APPEARANCE AND COLOR: AMMONIA IS A PUNGENT-SMELLING, TOXIC, CORROSIVE GAS HAVING A SUFFOCATING ODOR. THIS GAS IS LIGHTER THAN AIR AND FUMES STRONGLY IN DIST AIR, PRODUCING A CLOUD OF AMMONIUM HYDROXIDE MIST.

HOW TO DETECT THIS SUBSTANCE (WARNING PROPERTIES): THE ODOR AND DENSE APPEARANCE OF THIS GAS ARE DISTINCTIVE WARNING PROPERTIES ASSOCIATED WITH AMMONIA.

#### 10. STABILITY AND REACTIVITY

STABILITY: STABLE.

DECOMPOSITION PRODUCTS: AMMONIA GAS DECOMPOSES INTO HYDROGEN AND NITROGEN AT ABOUT 450-500 DEG C (842-932 DEG F). DECOMPOSITION WILL OCCUR AT LOWER TEMPERATURES IN THE PRESENCE OF METALS SUCH AS IRON, NICKEL AND ZINC AND, TO A LESSER EXTENT, CATALYTIC SURFACES, SUCH AS PORCELAIN AND PUMICE. IN THE PRESENCE OF CATALYSTS, DECOMPOSITION BEGINS AS LOW AS 300 DEG C (572 DEG F) AND IS COMPLETE AT 500-600 DEG C (932-1112 DEG F). IT HAS ALSO BEEN REPORTED THAT THE MAIN PRODUCTS OF COMBUSTION IN AIR (AT/OR ABOVE 780 DEG C (1436 DEG

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 012

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

-----  
F)) ARE NITROGEN AND WATER, WITH SMALL AMOUNTS OF NITROGEN DIOXIDE AND AMMONIUM NITRATE.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: AMMONIA IS NOT COMPATIBLE WITH MOST METALS, ACIDS, OR OXIDIZERS. AMMONIA CAN FORM EXPLOSIVE COMPOUNDS WITH MERCURY, GOLD OR SILVER COMPOUNDS OR THE ELEMENTS. AMMONIA REACTS VIOLENTLY WITH TELLURIUM TETRABROMIDE AND TETRACHLORIDE, CHLORINE, BROMINE, FLUORINE, OR THE INTERHALOGEN COMPOUNDS, AND WITH ACID HALIDES, ETHYLENE OXIDE, AND HYPOCHLORITES (INCLUDING HOUSEHOLD BLEACH). POISONING OR DEATH CAN OCCUR IF AMMONIA (OR AMMONIA-CONTAINING PRODUCTS) ARE MIXED WITH HOUSEHOLD BLEACH.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

CONDITIONS TO AVOID: EXTREME HEAT, FIRE, OR CONTACT WITH INCOMPATIBLE CHEMICALS.

PART IV IS THERE ANY OTHER USEFUL INFORMATION ABOUT THIS MATERIAL?

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: THE FOLLOWING INFORMATION IS FOR AMMONIA (GAS):

CLO (INHALATION, HUMAN) = 30000 PPM/ 5 MINUTES

CLO (INHALATION, HUMAN) = 20 PPM; IRRITATION

LDLO (UNKNOWN, MAN) = 132 MG/KG

LD50 (ORAL, RAT) = 350 MG/KG

CLO (INHALATION, RAT) = 2000 PPM/4 HOURS

LCLO (INHALATION, CAT) = 7000 PPM/1 HOUR

TCLO (INHALATION, CAT) = 1000 PPM/10 MINUTES

CLO (INHALATION, MAMMAL) = 5000 PPM/5 MINUTES

CLO (INHALATION, RABBIT) = 7000 PPM/1 HOUR

MUTATION IN MICROORGANISMS (ESCHERICHIA COH) = 1500 PPM/3 HOURS

GENOTOXIC ANALYSIS (RAT, INHALATION) = 19,800 5G/M3/16 WEEKS

LD50 (INHALATION, MOUSE) = 4837 PPM/1 HOUR

SUSPECTED CANCER AGENT: AMMONIA IS NOT FOUND ON THE FOLLOWING LISTS: FEDERAL SHA Z LIST, NTP, CAUOSHA OR IARC AND THEREFORE IS NOT CONSIDERED TO BE, NOR SUSPECTED TO BE A CANCER-CAUSING AGENT BY THESE AGENCIES.

IRRITANCY OF PRODUCT: AMMONIA IS SEVERELY IRRITATING TO CONTAMINATED TISSUE.

SENSITIZATION OF PRODUCT: AMMONIA IS NOT KNOWN TO BE A SKIN OR RESPIRATORY SENSITIZER.

REPRODUCTIVE TOXICITY INFORMATION: LISTED BELOW IS INFORMATION CONCERNING THE EFFECTS OF AMMONIA ON THE HUMAN REPRODUCTIVE SYSTEM.

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 013

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

MUTAGENICITY: AMMONIA HAS NOT BEEN REPORTED TO CAUSE MUTAGENIC EFFECTS IN HUMANS. AMMONIA HAS BEEN REPORTED TO CAUSE MUTAGENIC EFFECTS IN SPECIFIC ANIMAL TISSUES DURING EXPERIMENTAL STUDIES WITH EXPOSURES AT RELATIVELY HIGH DOSES.

EMBRYOTOXICITY: AMMONIA HAS NOT BEEN REPORTED TO CAUSE EMBRYOTOXIC EFFECTS

TERATOGENICITY: AMMONIA HAS NOT BEEN REPORTED TO CAUSE TERATOGENIC EFFECTS.

REPRODUCTIVE TOXICITY: AMMONIA IS NOT EXPECTED TO CAUSE ADVERSE REPRODUCTIVE EFFECTS IN HUMANS.

A MUTAGEN IS A CHEMICAL WHICH CAUSES PERMANENT CHANGES TO GENETIC MATERIAL (DNA) SUCH THAT THE CHANGES WILL PROPAGATE THROUGH GENERATION LINES. AN EMBRYOTOXIN IS A CHEMICAL WHICH CAUSES DAMAGE TO A DEVELOPING EMBRYO (I.E. WITHIN THE FIRST EIGHT WEEKS OF PREGNANCY IN HUMANS), BUT THE DAMAGE DOES NOT PROPAGATE ACROSS GENERATIONAL LINES. A TERATOGEN IS A CHEMICAL WHICH CAUSES DAMAGE TO A DEVELOPING FETUS, BUT THE DAMAGE DOES NOT PROPAGATE ACROSS GENERATIONAL LINES. A REPRODUCTIVE TOXIN IS ANY SUBSTANCE WHICH INTERFERES IN ANY WAY WITH THE REPRODUCTIVE PROCESS.

BIOLOGICAL EXPOSURE INDICES (BEIS): CURRENTLY, BIOLOGICAL EXPOSURE INDICES (BET) HAVE NOT BEEN DETERMINED FOR AMMONIA.

## 12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: AMMONIA IS STABLE AND FOUND NATURALLY IN THE ENVIRONMENT (SOURCES INCLUDE VOLCANOES). ALL WORK PRACTICES SHOULD BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION. ADDITIONAL ENVIRONMENTAL INFORMATION FOR AMMONIA IS AVAILABLE AS FOLLOWS:

ATMOSPHERIC FATE: IT IS ASSUMED THAT AMMONIA COMBINES WITH SULFATE ION IN THE ATMOSPHERE OR IN WASHOUT BY RAINFALL RESULTING IN A RAPID RETURN OF AMMONIA TO THE SOIL.

BIODEGRADATION: WHEN AMMONIA APPEARS IN WATER UNDER THE NORMAL CONDITIONS (AEROBIC), IT IS RAPIDLY CONVERTED TO NITRATE BY NITRIFICATION; THE PRINCIPAL WATER CONTAMINANT NORMALLY BEING NITRATE. THE PH IN WATER IS INCREASED BY THE PRESENCE OF AMMONIA ION, IN THE FORM OF HYDROXIDE IONS. BACTERIA CONVERT THE AMMONIA TO NITRATE CREATING AN OXYGEN DEMAND (BOD) SEVERAL DAYS AFTER THE INTRODUCTION OF AMMONIA. THE BACTERIA THAT OXIDIZE AMMONIA TO NITRATE ARE PRIMARILY OF THE GENUS NITROSOMONAS; CONVERSION OF NITRITE TO NITRATE IS CARRIED OUT PRIMARILY BY THE GENUS NITROBACTER. TEMPERATURE, OXYGEN SUPPLY, AND PH OF THE WATER ARE FACTORS IN DETERMINING THE RATE OF OXIDATION.

REPORT NUMBER: 703

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 014

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

-----  
BIOCONCENTRATION: PLANTS HAVE A HIGH AFFINITY FOR GASEOUS AMMONIA WHEN LEAF STOMATA ARE OPEN IN DAYLIGHT.

SOIL ADSORPTION/MOBILITY: AMMONIA IS STRONGLY ADSORBED ON SOIL, AND ON SEDIMENT PARTICLES AND COLLOIDS IN WATER. THIS ADSORPTION RESULTS IN HIGH CONCENTRATIONS OF SORBED AMMONIA IN OXIDIZED SEDIMENTS. UNDER ANOXIC CONDITIONS, THE ADSORPTIVE CAPACITY OF SEDIMENTS IS LESS, RESULTING IN THE RELEASE OF AMMONIA TO EITHER THE WATER COLUMN OR AN OXIDIZED SEDIMENT LAYER ABOVE. IN CLAY, THE ION TENDS TO BE ADSORBED ON THE NEGATIVE ADSORPTION SITES OF CLAY COLLOIDS. IT MAY SUBSTITUTE FOR POTASSIUM IN THE LATTICE STRUCTURE OF A CLAY MINERAL.

EFFECT OF MATERIAL ON PLANTS OR ANIMALS: DUE TO THE CORROSIVE NATURE OF AMMONIA, ANIMALS EXPOSED TO THIS PRODUCT WILL EXPERIENCE TISSUE DAMAGE, BURNS, AND MAY BE KILLED. OXYGEN DISPLACEMENT CAN ALSO BE A FACTOR IN THE TOXICITY OF AMMONIA. PLANTS CONTAMINATED WITH AMMONIA MAY BE ADVERSELY AFFECTED OR DESTROYED.

EFFECT OF CHEMICAL ON AQUATIC LIFE: AMMONIA IS VERY SOLUBLE IN WATER, AND IN LOW CONCENTRATIONS OF AMMONIA IN WATER IS DETRIMENTAL TO AQUATIC LIFE. IF A RELEASE OF AMMONIA OCCURS NEAR A RIVER OR OTHER BODY OF WATER, THE RELEASE HAS THE POTENTIAL TO KILL FISH AND OTHER AQUATIC LIFE. ADDITIONAL AQUATIC TOXICITY INFORMATION IS AVAILABLE FOR AMMONIA AS FOLLOWS:

LC (GOLDFISH, YELLOW PERCH) = 2.0-2.5 PPM/1- 4 DAYS

LC100 (CRAYFISH) = 60-80 PPM/3 DAYS

LC50 (FATHEAD MINNOW) = 8.2 PPM/96 HOURS LC50 (COHO SALMON) = 0.45 MG/U96 HOURS

LC50 (GUPPY FRY) = 1.2-74 MG/U72 HOURS

LC50 (CUTTHROAT TROUT FRY, SALMO DARK) = 0.5-  
.8 MG/U96 HOURS

LC50 (RAINBOW TROUT: FERTILIZED EGG, ALEVINS (050 DAYS OLD), FRY (85 DAYS OLD),

ADULTS) = >3.58, >3.58, 0.068, 0.097 MG/U24 HOURS

LC50 (WALKING CATFISH) = 0.28 MG/U48 HOURS

LC50 (SALMO TRUTTA) = >0.15 MG/L, 0.6-0.9 MG/L / 18 HOURS, 96 HOURS

LC50 (SALVELINUS FONTINALIS) = 0.96-1.05 MG/L, 96 HOURS

LC50 (CATOSTOMUS PLATYRHYNCHOS) = 0.670.82 MG/L, 96 HOURS

LC50 (OIMEPHALES PROMELAS) = 0.73-3.4 MG/L, 96 HOURS

LC50 (CATOSTMUS COMMERSONI) = 0.79-1.4 MG/L, 96 HOURS

LC50 (LEPOMIS MACROCHIRUS) = 0.26-4.6 MG/L, 96 HOURS

LC50 (LEPOMIS MACROCHIRUS) = 0.024-2.3 MG/L, 48 HOURS

LC50 (MICROPTERUS SALMOIDES) = >0.21-1.7 MG/L, 96 HOURS

LC50 (NOTROPIS LUTRENSIS) = 0.9-1.1 MG/L, 96 HOURS

LC50 (MUGLI CEPHALUS) = 1.2-2.4 MG/L, 96 HOURS

LC50 (MORONE AMERICANA) = 0.52-2.13 MG/L, 96 HOURS

LC50 (NOTROPIS SPILOPTERUS) = 1.2-1.35 MG/L, 96 HOURS

LC50 (LEPOMIS CYANELLUS) = 0.6-2.1 MG/L, 96 HOURS

REPORT NUMBER: 703

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 015

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

-----  
LC50 (LEPOMIS GIBBOSUS) = 0.14-0.86 MG/L, 96 HOURS

### 13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: PRODUCT REMOVED FROM THE CYLINDER MUST BE DISPOSED OF IN ACCORDANCE WITH APPROPRIATE U.S. FEDERAL, STATE, AND LOCAL REGULATIONS OR WITH REGULATIONS OF CANADA AND ITS PROVINCES. RETURN CYLINDERS WITH RESIDUAL PRODUCT TO AIRGAS, INC. DO NOT DISPOSE OF LOCALLY.

### 14. TRANSPORTATION INFORMATION

THIS GAS IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

#### FOR U.S. DOMESTIC SHIPMENTS:

PROPER SHIPPING NAME: AMMONIA, ANHYDROUS  
HAZARD CLASS NUMBER AND DESCRIPTION: 2.2 (NON-FLAMMABLE GAS)  
UN IDENTIFICATION NUMBER: UN 1005  
PACKING GROUP: NOT APPLICABLE  
DOT LABEL(S) REQUIRED: CLASS 2.2 (NON-FLAMMABLE GAS)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 125 FOR INTERNATIONAL SHIPMENTS:

PROPER SHIPPING NAME: AMMONIA, ANHYDROUS  
HAZARD CLASS NUMBER AND DESCRIPTION: 2.3 (TOXIC GAS), 8 (CORROSIVE)  
UN IDENTIFICATION NUMBER: UN 1005  
PACKING GROUP: NOT APPLICABLE  
DOT LABEL(S) REQUIRED: CLASS 2.3 (TOXIC GAS); CLASS 8 (CORROSIVE)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 125

MARINE POLLUTANT: AMMONIA IS NOT DESIGNATED BY THE DEPARTMENT OF TRANSPORTATION

TO BE A MARINE POLLUTANT (49 CFR 172.101, APPENDIX B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: AMMONIA IS CONSIDERED AS DANGEROUS GOODS, PER REGULATIONS OF TRANSPORT CANADA. THE USE OF THE ABOVE U.S. DOT INFORMATION FROM THE U.S. 49 CFR REGULATIONS IS ALLOWED FOR SHIPMENTS THAT ORIGINATE IN THE U.S. FOR SHIPMENTS VIA GROUND VEHICLE OR RAIL THAT ORIGINATE IN CANADA, THE FOLLOWING INFORMATION IS APPLICABLE.

PROPER SHIPPING NAME: AMMONIA, ANHYDROUS  
HAZARD CLASS NUMBER AND DESCRIPTION: 2.2 (NON-FLAMMABLE GAS), 8 (CORROSIVE)  
UN IDENTIFICATION NUMBER: UN 1005  
PACKING GROUP: NOT APPLICABLE  
DOT LABEL(S) REQUIRED: CLASS 2.2 (NON-FLAMMABLE GAS); CLASS 8 (CORROSIVE)

REPORT NUMBER: 703

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 016

MSDS NO: P1043VS

MAINFRAME UPLOAD DATE: 12/08/05

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

SPECIAL PROVISIONS: NONE  
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 0  
ERAP INDEX: 3000  
PASSENGER CARRYING SHIP INDEX: FORBIDDEN  
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: FORBIDDEN  
MARINE POLLUTANT: POTENTIAL MARINE POLLUTANT.

#### 15. REGULATORY INFORMATION

##### ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: AMMONIA IS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTIONS 302, 304, AND 313 OF TITLE III OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT, AS FOLLOWS:

CHEMICAL NAME	SARA 302 (40 CFR 355, APPENDIX A)	SARA 304 (40 CFR TABLE 302.4)	SARA 313 (40 CFR 372.65)
AMMONIA	YES	YES	YES

J.S. SARA THRESHOLD PLANNING QUANTITY: 500 LB (227 KG)

U.S. CERCLA REPORTABLE QUANTITY (RQ): AMMONIA CERCLA RQ = 100 LB (45.4 KG);  
AMMONIA EHS (EXTREMELY HAZARDOUS SUBSTANCE) RQ = 100 LB (45.4 KG).

J.S. TSCA INVENTORY STATUS: AMMONIA IS LISTED ON THE TSCA INVENTORY.

OTHER U.S. FEDERAL REGULATIONS: AMMONIA IS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 112(R) OF THE CLEAN AIR ACT. THE THRESHOLD QUANTITY OF AMMONIA IS 10,000 LB (4450 KG). COMPLIANCE WITH THE OSHA PROCESS SAFETY STANDARD, 29 CFR 1910.119 MAY BE APPLICABLE TO OPERATIONS INVOLVING THE USE OF AMMONIA. UNDER THIS REGULATION AMMONIA IS LISTED IN APPENDIX A. THE THRESHOLD QUANTITY OF AMMONIA UNDER THIS REGULATION IS 10,000 LB (4450 KG). AMMONIA IS DESIGNATED AS A HAZARDOUS SUBSTANCE UNDER SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT AND FURTHER REGULATED BY THE CLEAN WATER ACT AMENDMENTS OF 1977 AND 1978. THESE REGULATIONS APPLY TO DISCHARGES OF AMMONIA.

U.S. STATE REGULATORY INFORMATION: AMMONIA IS COVERED UNDER THE FOLLOWING SPECIFIC STATE REGULATIONS:

ALASKA - DESIGNATED TOXIC AND HAZARDOUS SUBSTANCES: AMMONIA.  
CALIFORNIA - PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS: AMMONIA.  
FLORIDA - SUBSTANCE LIST: AMMONIA.  
ILLINOIS - TOXIC SUBSTANCE LIST: AMMONIA.  
IOWA - SECTION 302/313 LIST: AMMONIA.  
MASSACHUSETTS - SUBSTANCE LIST: AMMONIA.  
MINNESOTA - LIST OF HAZARDOUS SUBSTANCES: AMMONIA.  
MISSOURI - EMPLOYER INFORMATION/TOXIC SUBSTANCE LIST: AMMONIA.

REPORT NUMBER: 703

UNIVAR USA INC.

PAGE: 017

MSDS NO: P1043VS

MATERIAL SAFETY DATA SHEET

MAINFRAME UPLOAD DATE: 12/08/05

VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997

PROD NO : 744672

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NEW JERSEY - RIGHT TO KNOW HAZARDOUS SUBSTANCE LIST: AMMONIA.  
NORTH DAKOTA - LIST OF HAZARDOUS CHEMICALS, REPORTABLE QUANTITIES: AMMONIA.  
PENNSYLVANIA - HAZARDOUS SUBSTANCE LIST: AMMONIA  
RHODE ISLAND - HAZARDOUS SUBSTANCE LIST: AMMONIA  
TEXAS - HAZARDOUS SUBSTANCE LIST: AMMONIA.  
WEST VIRGINIA - HAZARDOUS SUBSTANCE LIST: AMMONIA  
WISCONSIN - TOXIC AND HAZARDOUS SUBSTANCES: AMMONIA

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):  
AMMONIA IS NOT ON THE CALIFORNIA PROPOSITION 65 LISTS.

CGA LABELING:

DANGER:

CORROSIVE LIQUID AND GAS UNDER PRESSURE.

CAN CAUSE EYE, SKIN, AND RESPIRATORY TRACT BURNS.

AVOID BREATHING GAS.

STORE AND USE WITH ADEQUATE VENTILATION.

KEEP AWAY FROM HEAT, FLAMES, AND SPARKS.

DO NOT GET IN EYES, ON SKIN OR CLOTHING.

USE ONLY WITH EQUIPMENT OF COMPATIBLE MATERIAL AND CONSTRUCTION.

CYLINDER TEMPERATURE SHOULD NOT EXCEED 52 DEG C (125 DEG F).

CLOSE VALVE AFTER EACH USE AND WHEN EMPTY.

USE IN ACCORDANCE WITH THE MATERIAL SAFETY DATA SHEET.

NOTE:

SUCK-BACK INTO CYLINDER MAY CAUSE RUPTURE.

ALWAYS USE A BACK FLOW PREVENTATIVE DEVICE IN PIPING.

FIRST-AID:

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL  
RESPIRATION. (RESCUER MAY RECEIVE CHEMICAL BURNS AS A RESULT OF GIVING MOUTH  
TO MOUTH). IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN. KEEP  
UNDER MEDICAL OBSERVATION.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH WATER FOR AT LEAST 15  
MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. CALL A PHYSICIAN.  
WASH CLOTHING BEFORE REUSE. (DISCARD CONTAMINATED SHOES).  
DO NOT REMOVE THIS PRODUCT LABEL.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: AMMONIA IS ON THE DSL INVENTORY.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:

AMMONIA IS NOT ON THE CEPA PRIORITIES SUBSTANCES LISTS.

CANADIAN WHMIS SYMBOLS:

CLASS A: COMPRESSED GAS

CLASS E: CORROSIVE MATERIAL

REPORT NUMBER: 703  
MSDS NO: P1043VS  
MAINFRAME UPLOAD DATE: 12/08/05

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 018  
VERSION: 008

PRODUCT: ANHYDROUS AMMONIA

ORDER NO: 325997  
PROD NO : 744672

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----- FOR ADDITIONAL INFORMATION -----  
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CONTACT: MSDS COORDINATOR UNIVAR USA INC.  
DURING BUSINESS HOURS, PACIFIC TIME (425)889-3400

04/28/06 14:09 PRODUCT: 744672 CUST NO: 386323 ORDER NO: 325997

----- NOTICE -----  
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ALL EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A

-----  
PARTICULAR PURPOSE, WITH RESPECT TO THE PRODUCT OR INFORMATION PROVIDED

-----  
HEREIN, AND SHALL UNDER NO CIRCUMSTANCES BE LIABLE FOR INCIDENTAL OR

-----  
CONSEQUENTIAL DAMAGES. \*\*  
-----

DO NOT USE INGREDIENT INFORMATION AND/OR PERCENTAGES IN THIS MSDS AS A  
PRODUCT SPECIFICATION. FOR PRODUCT SPECIFICATION INFORMATION REFER TO A PRODUCT  
SPECIFICATION SHEET AND/OR A CERTIFICATE OF ANALYSIS. THESE CAN BE OBTAINED FROM  
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PROCESS.

\* \* \* E N D O F M S D S \* \* \*

## APPENDIX C

### EMERGENCY RESPONSE PROCEDURE FOR A RELEASE OF PROPANE

#### (See also Section 2.1.3 of the Emergency Response Plan)

The following steps will be followed for an uncontrolled release of propane. The steps should be followed in the order set out below, unless more than one crew is mobilized, in which case some of the steps can be taken simultaneously by different crews. The Incident Commander has the authority to vary from the steps set out below if he deems it necessary in the circumstances to protect public health, safety or the environment.

#### **CAUTION: PROPANE IS EXTREMELY FLAMMABLE. RISK OF FIRE OR EXPLOSION**

1. A release of propane would most likely occur suddenly. The person who would first witness the release should immediately contact his or her supervisor who would activate the evacuation alarm by using the "dial 184" notification system.
2. Evacuate all personnel from the Mill site to a location upwind of the spill, and account for all personnel, including all contractors and visitors at the Mill and all ore, product and reagent truck drivers, in accordance with the Emergency Evacuation and Shutdown Procedure described in Appendix J.
3. Determine Incident Commander. The Incident Commander will be the Mill Manager, or in his absence the Mill Superintendent, or in the absence of both the Mill Manager and the Mill Superintendent, the RSO. Shift Foremen are in charge and are responsible for all emergency procedures until the Incident Commander arrives.
4. Determine crews that may be required (see Section 4.2.2 of the Plan for a discussion of the available crews at the disposal of the Incident Commander).
5. Mobilize trained personnel and emergency equipment such as SCBAs, first aid equipment etc. See U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration 2008 Emergency Response Guidebook (the "DOT Guidebook") for appropriate protective clothing. In that Guidebook, propane has an ID No. of 1075 and is covered by Guide No. 115. A copy of Guide 115 is attached to this Appendix.
6. Initiate rescue operations for any people who may be trapped by the release; do this only with properly trained and equipped personnel.
7. In the event of a spill or leak, follow the procedures set out under the heading "Spill or Leak" in Guide No. 115.







- No redundant equipment is available and operable to perform the required safety function.

In the event of any such damage, the Incident Commander or RSO will make a determination if it is safe for personnel to re-enter the facility or any portion of the facility or whether or not any portion of the facility must be shut down because it cannot be operated safely and in accordance with all license or permit conditions, laws and regulations;

- Damage to any licensed material or any device, container or equipment containing licensed material

21. The Incident Commander or RSO will make a determination if it is safe for personnel to re-enter the facility or any portion of the facility or whether or not any portion of the facility must remain shut down;

22. The Site Incident Commander will make the decision to terminate the emergency or enter into recover mode, or to escalate the emergency to a different category if necessary.

23. Notification of Regulatory Agencies:

A member of Mill management or Corporate management will notify the following regulating agencies as indicated below:

- Immediate Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified:

- Immediately if the event involved byproduct, source or special nuclear material possessed by the Mill that may have caused or threatens to cause any individual to receive doses at the levels specified in R313-15-1202(1)(a) or the release of radioactive material inside or outside of the restricted area that could cause an individual to receive an intake five times the annual permissible intake as specified in R313-15-1202(1)(b); and
- as soon as possible, but not later than 4 hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed regulatory limits or releases of licensed material that could exceed regulatory limits (events may include fires, explosions, toxic gas releases etc.) (see 10 CFR 40.60);

- 24 Hour Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified within 24 hours after the discovery of:

- any of the events listed in 10 CFR 40.60.; or
- any of the events listed in R313-15-1202(2).

- Report to MSHA

Any fire or explosion at the Mill facility must be reported within 15 minutes to MSHA - 1-800-746-1553.

#### 24. Written Reports

The RSO will prepare a written report of the incident for Mill files. In addition, the RSO will prepare a written report and submit it to the State of Utah Division of Radiation Control within 30 days of the incident. The written report will contain the information required by R313-15-1203(2) and 10 CFR 40.60 (c)(2), as applicable.

ID No.	Guide No.	Name of Material	ID No.	Guide No.	Name of Material
1063	115	Refrigerant gas R-40	1077	115	Propylene
1064	117	Methyl mercaptan	1078	126	Dispersant gas, n.o.s.
1065	121	Neon	1078	126	Refrigerant gas, n.o.s.
1065	121	Neon, compressed	1079	125	Sulfur dioxide
1066	121	Nitrogen	1079	125	Sulphur dioxide
1066	121	Nitrogen, compressed	1080	126	Sulfur hexafluoride
1067	124	Dinitrogen tetroxide	1080	126	Sulphur hexafluoride
1067	124	Nitrogen dioxide	1081	116P	Tetrafluoroethylene, stabilized
1069	125	Nitrosyl chloride	1082	119P	Trifluorochloroethylene, stabilized
1070	122	Nitrous oxide	1083	118	Trimethylamine, anhydrous
1070	122	Nitrous oxide, compressed	1085	116P	Vinyl bromide, stabilized
1071	119	Oil gas	1086	116P	Vinyl chloride, stabilized
1071	119	Oil gas, compressed	1087	116P	Vinyl methyl ether, stabilized
1072	122	Oxygen	1088	127	Acetal
1072	122	Oxygen, compressed	1089	129	Acetaldehyde
1073	122	Oxygen, refrigerated liquid (cryogenic liquid)	1090	127	Acetone
1075	115	Butane	1091	127	Acetone oils
1075	115	Butane mixture	1092	131P	Acrolein, stabilized
1075	115	Butylene	1093	131P	Acrylonitrile, stabilized
1075	115	Isobutane	1098	131	Allyl alcohol
1075	115	Isobutane mixture	1099	131	Allyl bromide
1075	115	Isobutylene	1100	131	Allyl chloride
1075	115	Liquefied petroleum gas	1104	129	Amyl acetates
1075	115	LPG	1105	129	Amyl alcohols
1075	115	Petroleum gases, liquefied	1105	129	Pentanol
1075	115	Propane	1106	132	Amylamines
1075	115	Propane mixture	1107	129	Amyl chloride
1075	115	Propylene	1108	128	n-Amylene
1076	125	CG	1108	128	1-Pentene
1076	125	Diphosgene	1109	129	Amyl formates
1076	125	DP	1110	127	n-Amyl methyl ketone
1076	125	Phosgene	1110	127	Amyl methyl ketone

**POTENTIAL HAZARDS****FIRE OR EXPLOSION**

- **EXTREMELY FLAMMABLE.**
- Will be easily ignited by heat, sparks or flames.
- Will form explosive mixtures with air.
- Vapors from liquefied gas are initially heavier than air and spread along ground.

**CAUTION: Hydrogen (UN1049), Deuterium (UN1957), Hydrogen, refrigerated liquid (UN1966) and Methane (UN1971) are lighter than air and will rise. Hydrogen and Deuterium fires are difficult to detect since they burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)**

- Vapors may travel to source of ignition and flash back.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

**HEALTH**

- Vapors may cause dizziness or asphyxiation without warning.
- Some may be irritating if inhaled at high concentrations.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire may produce irritating and/or toxic gases.

**PUBLIC SAFETY**

- **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Keep out of low areas.

**PROTECTIVE CLOTHING**

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.
- Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

**EVACUATION****Large Spill**

- Consider initial downwind evacuation for at least 800 meters (1/2 mile).

**Fire**

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

**EMERGENCY RESPONSE****FIRE**

- **DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

**CAUTION:** Hydrogen (UN1049), Deuterium (UN1957) and Hydrogen, refrigerated liquid (UN1966) burn with an invisible flame. Hydrogen and Methane mixture, compressed (UN2034) may burn with an invisible flame.

**Small Fire**

- Dry chemical or CO<sub>2</sub>.

**Large Fire**

- Water spray or fog.
- Move containers from fire area if you can do it without risk.

**Fire involving Tanks**

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

**SPILL OR LEAK**

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Prevent spreading of vapors through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.

**CAUTION:** When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

**FIRST AID**

- Move victim to fresh air. • Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. • Keep victim warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

# MATERIAL SAFETY DATA SHEET

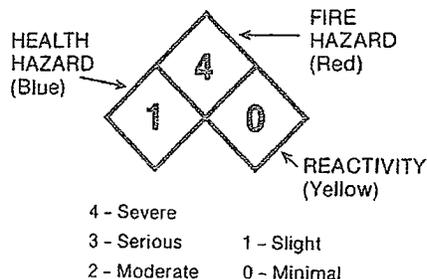
EFFECTIVE MARCH 1, 1995

AmeriGas Propane, L.P.  
P.O. Box 965, Valley Forge, PA 19482

TRANSPORTATION CHEMTREC NO.  
EMERGENCY NO.: 800-424-9300

GENERAL SAFETY DEPT.  
INFORMATION: 610-337-1000

**DANGER!** Extremely flammable liquefied gas under pressure. Keep away from heat, sparks, flame, and all other ignition sources. Vapor reduces oxygen available for breathing and may cause suffocation in confined spaces. Use only with adequate ventilation. Odor may not provide adequate warning of leaks. Use of propane gas detectors in accordance with manufacturer's instructions is recommended. Vapor is heavier than air and may collect at low levels. Liquid may cause freeze burn similar to frostbite. Do not get liquid in eyes, on skin, or on clothing. Avoid prolonged breathing of vapor. Keep container valve closed when not in use. Do not allow container to run empty. (See "Warning-Limitation of Propane Odorant: You May Not Always Smell Leaking Propane" supplied with this MSDS.)



## SECTION I — IDENTIFICATION

**PRODUCT:** Propane **CHEMICAL FAMILY:** Paraffinic Hydrocarbon  
**SYNONYMS:** Liquefied Petroleum Gas; LP-Gas; LPG **CHEMICAL FORMULA:** C3H8

## SECTION II — INGREDIENTS

MATERIAL	CAS NUMBER	PERCENT (approximate)
ETHANE	74-84-0	0-5.0
PROPANE	74-98-6	87.5-100
PROPYLENE	115-07-1	0-5.0
BUTANES	Various	0-2.5
ETHYL MERCAPTAN	75-08-01	0-50 ppm

## SECTION III — HEALTH INFORMATION

**INHALATION:** Asphyxiant in high concentrations due to dilution of available oxygen. At excessive vapor concentrations, this product has anesthetic, asphyxiating properties and may cause sleepiness. At levels above 100,000 ppm (i.e. 10%), propane is mildly irritating to the respiratory tract and may result in dizziness, headache, drowsiness, nausea, shortness of breath, muscular incoordination, excessive salivation, disorientation, vomiting, and excitation. In extreme cases, convulsions, unconsciousness and death may occur as a result of asphyxiation. Persons with chronic respiratory disease should avoid exposure.

**INGESTION:** Liquid may cause freeze burn similar to frostbite. Ingestion not expected to occur in normal use.

**EYE CONTACT:** Liquid may cause freeze burn similar to frostbite.

**SKIN CONTACT:** Liquid may cause freeze burn similar to frostbite.

**OTHER:** Product is not listed by IARC, NTP or OSHA as a potential carcinogen. Propane and some of the minor components have been reported to be cardiac sensitizers in experiments.

## SECTION IV — OCCUPATIONAL EXPOSURE LIMITS

MATERIAL	PEL/TWA	TLV/TWA
ETHANE	Not Established	Simple Asphyxiant
PROPANE	1000 ppm	Simple Asphyxiant
PROPYLENE	Not Established	Simple Asphyxiant
BUTANES	800 ppm	800 ppm

## SECTION V — EMERGENCY AND FIRST AID PROCEDURE

### FOR OVEREXPOSURE BY:

**INHALATION:** Remove victim from further exposure and into fresh air. Provide oxygen if breathing is difficult. If victim is unconscious, get prompt medical attention.

**SKIN CONTACT:** If freeze burn occurs, remove contaminated clothes, shoes and jewelry. Immerse burned area in warm (not hot) water. Keep immersed. Get prompt attention.

**EYE CONTACT:** For contact with liquid, flush immediately with water. Obtain immediate medical attention.

**INGESTION:** If swallowed, get immediate medical attention.

## SECTION VI — PHYSICAL DATA

**BOILING POINT:** .....-44 F  
**MELTING POINT:** .....N/A  
**VAPOR PRESSURE:** .....196 psig @ 100 F  
**SPECIFIC GRAVITY (H2O = 1):** .....0.504  
**VAPOR DENSITY (AIR = 1):** .....1.50  
**SOLUBILITY IN WATER:** .....Slight, 0.1 to 1.0%  
**APPEARANCE AND ODOR:** .....Colorless, odorless in natural form

SCRATCH'N SNIFF  
SCRATCH'N SNIFF

**ODORANT WARNING:** Odorant is added to aid in detection of leaks. There is a Scratch 'n Sniff panel located here. One common odorant is ethyl mercaptan, CAS No. 75-08-1. Odorant is effective for detection of leaks in most instances, but not everyone can smell the odor. The ability of people to detect odors varies widely. Also, certain chemical reactions with material in the propane system can reduce or eliminate the propane odor

resulting in the possibility that a person can be in the presence of leaking propane and not be alerted by smell. No odorant will be 100% effective in all circumstances. Accordingly, the use of propane gas detectors in accordance with manufacturer's instructions by you and your customers is recommended. If odor level appears to be weak, notify your propane supplier immediately. Read and understand "Warning-Limitations of Propane Odorant: You May Not Always Smell Leaking Propane" supplied with this MSDS. If you do not have a copy of this warning, obtain one from AmeriGas/Petrolane immediately.

## SECTION VII — FIRE AND EXPLOSION HAZARDS

**FLASH POINT & METHOD USED:** .....-156 F (estimated)  
**IGNITION TEMPERATURE IN AIR:** .....920 - 1,120 F  
**FLAMMABLE LIMITS IN AIR, % BY VOLUME:** ... LOWER: 2.2%  
UPPER: 9.6%

**NFPA RATING (Under Fire Conditions. Does not apply to exposure hazards other than during fire):**

**HEALTH:** .....1 Slight  
**FIRE:** .....4 Extremely flammable  
**REACTIVITY:** .....0 Stable

**FIREFIGHTING PROCEDURES:** Eliminate sources of ignition. Evacuate area. Notify fire department. Allow only trained, properly protected personnel in area. Shut-off source of gas, if possible. Allow fire to burn itself out after gas flow is shut off. If gas flow cannot be shut off, do not extinguish fire. Allow fire to burn itself out using high volume water supply to cool heat-exposed pressure containers and nearby equipment. Approach a flame enveloped container from the side, never the head ends. Use extreme caution when applying water to a container which has been exposed to heat or flame for more than a short time. For uncontrollable fires and when flame is impinging on container, withdraw all personnel and evacuate vicinity immediately.

**USUAL FIRE & EXPLOSION HAZARDS:** Firefighters should wear self-contained breathing apparatus in the positive pressure mode with a full facepiece when there is a possibility of exposure to smoke, fumes or hazardous decomposition products. Uncontrolled vapors spread rapidly, are heavier than air and are extremely flammable.

## SECTION VIII — REACTIVITY

**STABILITY:** ..... Stable

### HAZARDOUS

**POLYMERIZATION:** ..... Will not occur

### CONDITIONS & MATERIALS

**TO AVOID:** ..... Keep away from high heat, sparks, open flame, strong oxidizing agents. (See Section VI "Odorant Warning.")

### HAZARDOUS DECOMPOSITION PRODUCTS:

..... Incomplete combustion may yield carbon monoxide, a toxic gas.

## SECTION IX — EMPLOYEE PROTECTION

**CONTROL MEASURES:** Use local and dilution ventilation to maintain exposures below acceptable criteria.

**RESPIRATORY PROTECTION:** If concentrations are high enough to warrant supplied-air or self-contained breathing apparatus, atmosphere may be flammable (see Section VII). Appropriate precautions must be taken regarding flammability. For situations where flammability has been safely addressed and where control measures are not feasible or sufficient to achieve full conformance with acceptable criteria (Section IV), use NIOSH/MSHA approved respiratory protection (supplied-air or self-contained breathing apparatus as appropriate). Respirators should be selected based on form and concentration of contaminant in air and in accordance with OSHA (29 CFR 1910.134).

**PROTECTIVE CLOTHING:** Avoid skin contact with liquid because of possibility of freeze burn. Wear gloves and protective clothing which are impervious to the product for the duration of the anticipated exposure, goggles for protection against accidental release of pressurized products.

**PROPANE GAS DETECTORS:** The use of propane gas detectors in accordance with manufacturer's instructions is recommended.

## SECTION X — ENVIRONMENTAL PROTECTION

**ENVIRONMENTAL EFFECTS:** Avoid uncontrolled releases of this material. Liquid release will have possible effect on plant and animal life. Large liquid release will quickly vaporize to produce a large, vapor cloud. Vapor cloud is both a fire and asphyxiation hazard.

**SPILL OR LEAK PROCEDURES:** Product is extremely flammable. Vapor is heavier than air and may collect at lower levels. Flammable concentrations may be present below nose level. If there is a leak but no fire, do not ignite the escaped gas. Eliminate all ignition

sources. Do not smoke, do not use a nearby phone or turn electrical switches on and off. Evacuate area. If possible, remove leaking container to safe area. Stop flow of gas or allow vapor to disperse in a safe area. Water spray can be used to help dilute vapor concentration in air. The possibility exists that leaks will not be detectable by smell. Use of propane gas detectors in accordance with manufacturer's instructions is recommended. (See Section VI "Odorant Warning.")

**WASTE DISPOSAL:** Dispose of gas in accordance with applicable laws and regulations. Vent vapor in a safe location and insure that gas dissipates below the lower flammable limit. Controlled burning is preferred.

## SECTION XI — REGULATORY INFORMATION

### DOT PROPER SHIPPING

**NAME:** ..... Propane, Liquefied Petroleum Gas

**DOT HAZARD CLASS:** ..... Flammable Gas

**DOT I.D. NUMBER:** ..... UN 1075

### DOT EMERGENCY RE-

**SPONSE GUIDE:** .....: See Guide No. 22

**SARA TITLE III INFORMATION:** This product may contain over 1.0% propylene. This is subject to the reporting requirements of Section 313.

**HAZARD CATEGORY FOR SECTION 311/312 REPORTING:** Immediate (acute) health hazard. Fire hazard. Sudden release of pressure hazard.

**RCRA INFORMATION:** This product, when disposed of by incineration or flaring, is defined as an ignitable hazardous waste in Federal regulations. Hazardous waste number is D001. Refer to latest Federal or State regulations regarding proper means of disposal.

**TSCA STATUS:** All components of this product are listed on the TSCA inventory.

## SECTION XII — HANDLING AND STORAGE PRECAUTIONS

Store in an authorized location (outside, detached storage is preferred with adequate ventilation). Isolate from heat and ignition sources. Isolate from combustible materials. Provide separate storage locations for other compressed or flammable gases. Inspect cylinders frequently for leaks, dents, gouges and corrosion with emphasis on bottom of cylinder. Keep cylinders in an upright position at all times so that pressure relief valves communicate with vapor space. Some cylinders have directional arrows indicating upright position. If you have questions about the proper position of your cylinder, seek assistance from a qualified source. Propane equipment should be used in accordance with manufacturer's instructions. Do not drop or abuse cylinders. Do not allow cylinders to run empty. Keep container valve closed and plugged when not in use; if cylinder runs empty, close shutoff valve immediately. Install protective caps when cylinders are not connected for use. Empty containers retain some residue, so they should be treated as if they were full. Read and understand "Warning-Limitation of Propane Odorant: You May Not Always Smell Leaking Propane" supplied with this MSDS. If you do not have a copy of this warning, contact AmeriGas/Petrolane immediately.

The information presented herein is believed to be factual as it has been derived from the works and opinions of persons believed to be qualified experts; however, nothing contained in this information is to be taken as a warranty or representation for which the company bears legal responsibility. The user should review any recommendations in the specific context of the intended use to determine whether they are appropriate.

**PREPARED BY:** AmeriGas Propane, L.P.  
P.O. Box 965  
Valley Forge, PA 19482

**ISSUED:** 3/95

**SUPERSEDES:** 08/91

## APPENDIX D

### **EMERGENCY RESPONSE PROCEDURE FOR A LEACH TANK FAILURE OR SULFURIC ACID TANK FAILURE**

**(See also Sections 2.1.4 and 2.1.5 of the Emergency Response Plan)**

The following steps will be followed for a leach tank failure or a sulfuric acid tank failure. The steps should be followed in the order set out below, unless more than one crew is mobilized, in which case some of the steps can be taken simultaneously by different crews. The Incident Commander has the authority to vary from the steps set out below if he deems it necessary in the circumstances to protect public health, safety or the environment.

1. The person who would first witness the tank failure should immediately contact his or her supervisor who would, as an immediate precautionary measure, isolate the spill or leak area in all directions for at least 150 feet. All unauthorized personnel will be required to stay out of this area.
2. Determine Incident Commander. The Incident Commander will be the Mill Manager, or in his absence the Mill Superintendent, or in the absence of both the Mill Manager and the Mill Superintendent, the RSO. Shift Foremen are in charge and are responsible for all emergency procedures until the Incident Commander arrives.
3. Determine crews that may be required (see Section 4.2.2 of the Plan for a discussion of the available crews at the disposal of the Incident Commander).
4. Mobilize trained personnel and emergency equipment such as SCBAs, first aid equipment etc. See the Material Data Safety Sheet for sulfuric acid, a copy of which is attached to this Appendix.
5. Initiate rescue operations for any people who may be trapped by the release; do this only with properly trained and equipped personnel.
6. Guard against possible fires by shutting off electrical circuits, isolating gas lines and eliminating ignition sources from affected areas. See Exhibit 7 for a list and locations of the main shut-off valves.
7. Attend to any injured persons:
  - One of the following EMT-trained personnel should be contacted, if they are on-site to aid in the event of any injuries to personnel:
    - David Turk
  - Move victim to fresh air;
  - Give artificial respiration if victim is not breathing;

- **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device;**
- Administer oxygen if breathing is difficult;
- Remove and isolate contaminated clothing and shoes;
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes;
- For minor skin contact, avoid spreading material on unaffected skin;
- Removal of solidified molten material from skin requires medical assistance;
- Control any bleeding;
- Treat for shock, if necessary;
- Immobilize any fractures and stabilize for transportation;
- Scan the injured person for excessive alpha prior to transporting if time allows
  - (If alpha is excessive or there is no time to scan, notify the clinic/hospital personnel and the RSO);
- Keep victim warm and quiet;
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed;
- The Safety Coordinator or a Safety Technician will notify the following as needed:
  - Blanding Clinic 678-2254 or 678-3434 (930 N. 400 W.)
  - San Juan Hospital, Monticello 678-2830 or 587-2116 (364 W. 1st N.)
  - Ambulance Service, Blanding Dial 911
- Ensure that medical personnel are aware of the materials involved and take precautions to protect themselves; and
- If the Mill ambulance is used, an attendant must ride with the injured in addition to the driver, except where the injured could normally be transported in a car or pickup.

#### 8. Notification of Mill Management

The Incident Commander will notify one of the following of all incidents, if not already alerted and part of the Emergency Response crew:

- R.E. Bartlett 435-678-2495
- D. Turk 435-678-7802 or 435-459-9786
- R. Wallace 435-459-1093

#### 9. Notification of Corporate Management:

The Incident Commander is to call Harold Roberts, Ron Hochstein or David Frydenlund immediately.

- Harold Roberts (Executive Vice President).....303-389-4160 (office)  
303-756-9050 (home)  
303-902-2870 (cell)

- Ron Hochstein (President)..... 604-689-7842 (office)  
604-931-6334 (home)  
604-377-1167 (cell)
- ...David Frydenlund (Vice President).....303-628-7798 (office)  
303-221-0098 (home)  
303-808-6648 (cell)

10. Initiate necessary steps to contain and/or neutralize the release, in accordance with precautions set out in the Material Safety Data Sheet attached to this Appendix.

11. In the case of a release from the sulfuric acid tank, remove any contaminated soil to the Mill's tailings cells for disposal, in accordance with the precautions set out in the Material Safety Data Sheet attached to this Appendix. Make any notifications required under the Mill's Spill Response Plan, a copy of which is attached to this Plan as Appendix L.

12. Inspect facility for damage that may have resulted from a leach tank failure and identify any of the following types of damage to facilities

- Structural damage that could pose a hazard to workers. Any such areas should be cordoned off as appropriate;
- Damage or disability to equipment that is required to prevent releases of radionuclides exceeding regulatory limits, to prevent exposures to radioactive materials exceeding regulatory limits or to mitigate the consequences of an accident, when:
  - The equipment is required to be available and operable when it is disabled or fails to function; and
  - No redundant equipment is available and operable to perform the required safety function.

In the event of any such damage, the Incident Commander or RSO will make a determination if it is safe for personnel to re-enter the facility or any portion of the facility or whether or not any portion of the facility must be shut down because it cannot be operated safely and in accordance with all license or permit conditions, laws and regulations;

- Damage to any licensed material or any device, container or equipment containing licensed material.

13. The Incident Commander or RSO will make a determination if it is safe for personnel to re-enter the facility or any portion of the facility or whether or not any portion of the facility must remain shut down.

14. The Incident Commander will make the decision to terminate the emergency or enter into recover mode.

15. Notification of Regulatory Agencies:

A member of Mill management or Corporate management will notify the following regulating agencies as indicated below:

- Immediate Report to UDEQ may be necessary:

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified:

- Immediately if the event involved byproduct, source or special nuclear material possessed by the Mill that may have caused or threatens to cause any individual to receive doses at the levels specified in R313-15-1202(1)(a) or the release of radioactive material inside or outside of the restricted area that could cause an individual to receive an intake five times the annual permissible intake as specified in R313-15-1202(1)(b); and
- as soon as possible, but not later than 4 hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed regulatory limits or releases of licensed material that could exceed regulatory limits (events may include fires, explosions, toxic gas releases etc.) (see 10 CFR 40.60);

- 24 Hour Report to UDEQ may be necessary:

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified within 24 hours after the discovery of:

- any of the events listed in 10 CFR 40.60; or
- any of the events listed in R313-15-1202(2).

16. Written Reports

The RSO will prepare a written report of the incident for Mill files. In addition, if notification is required to be submitted to the State under paragraph 15 above, the RSO will prepare a written report and submit it to the State of Utah Division of Radiation Control within 30 days of the incident. The written report will contain the information required by R313-15-1203(2) and 10 CFR 40.60 (c)(2), as applicable.

REPORT NUMBER: 703

UNIVAR USA INC.

PAGE: 001

MSDS NO: DQ4950CR

MATERIAL SAFETY DATA SHEET

MAINFRAME UPLOAD DATE: 08/17/06

VERSION: 017

PRODUCT: SULFURIC ACID 77% - 100%

*Master*

ORDER NO: 334315

PROD NO : 603450

INTL. URANIUM (USA) CORP.  
6425 SO. HYW. 191

BLANDING ,UT 84511

UNIVAR USA INC.  
7425 NE UNION HILL RD , REDMOND

(425)889-3400  
, WA 98052

----- EMERGENCY ASSISTANCE -----

FOR EMERGENCY ASSISTANCE INVOLVING CHEMICALS CALL - CHEMTREC  
(800)424-9300

PRODUCT NAME: SULFURIC ACID 77% - 100%  
MSDS NUMBER: DU4950CR  
DATE ISSUED: 01/24/2006  
SUPERSEDES: 03/08/2005  
ISSUED BY: 004690

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MATERIAL SAFETY DATA SHEET

WHMIS (CLASSIFICATION)  
CLASS D-1A : VERY TOXIC MATERIAL CAUSING IMMEDIATE AND SERIOUS EFFECTS  
CLASS E : CORROSIVE MATERIAL

SECTION 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME: SULFURIC ACID 77% - 100%  
PRODUCT CODE: NONE

DISTRIBUTED BY:

REPORT NUMBER: 703

UNIVAR USA INC.

PAGE: 002

MSDS NO: DQ4950CR

MATERIAL SAFETY DATA SHEET

MAINFRAME UPLOAD DATE: 08/17/06

VERSION: 017

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315

PROD NO : 603450

UNIVAR USA INC.  
17425 NE UNION HILL ROAD  
REDMOND, WA 98052  
25-889-3400

PHONE NUMBER (TRANSPORTATION EMERGENCY)  
PHONE NUMBER (TRANSPORTATION EMERGENCY)

CANADA 1-877-ERP-ACID (377-2243)  
U.S.A. 1-800-424-9300 CHEMTREC

SYNONYMS: DIHYDROGEN SULFATE ; OIL OF VITRIOL ; VITRIOL BROWN OIL ACIDE  
SULFURIQUE (FRENCH)

DSL (DOMESTIC SUBSTANCE LIST): LISTED

NAME / CHEMICAL FORMULA: SULFURIC ACID / H<sub>2</sub>SO<sub>4</sub>

CHEMICAL FAMILY: ACID

UTILIZATION: CHEMICAL INDUSTRIES

SECTION 2. COMPOSITION AND INFORMATION ON INGREDIENTS

NAME	CAS #	PERCENTAGE (%)	EXPOSURE LIMITS	
			ACGIH (U.S.A.) 2005 TLV-TWA (MG/M3)	OSHA (U.S.A.) PEL - TWA (MG/M3)
SULFURIC (ACID)	7664-93-9	77 % TO 100 %	0.2 (THORACIC FR.)	1
50 DEG TECHNICAL		77.7		
66 DEG TECHNICAL		93.2		
1.835 ELECTROLYTE		93.2		
78 % TECHNICAL		98		
99 % TECHNICAL		99		
100 % TECHNICAL		100		
WATER	7732-18-5	0-22	N/E	N/E

ACGIH: AMERICAN CONFERENCE GOVERNMENTAL INDUSTRIAL HYGIENISTS.  
OSHA : OCCUPATIONAL SAFER AND HEALTH ADMINISTRATION.

N/E = NOT ESTABLISHED

NOTE: SULFURIC (ACID): EXPOSURE LIMITS MAY BE DIFFERENT IN OTHER JURISDICTIONS. NIOSH REL-TWA (J10 HOURS) : 1 MG/M3 IDLH ; 15 MG/M3. ORAL ACUTE (LD50) : 2 140 MG/KG (RAT) ; INHALATION (LC50, 2 HOURS) : 510 MG/M3(RAT) ; 320 MG/M3 (MOUSE). (RTECS). CONSULT LOCAL AUTHORITIES FOR ACCEPTABLE EXPOSURE LIMITS.

SECTION 3. RISK IDENTIFICATION FOR HUMAN HEALTH

REPORT NUMBER: 703

UNIVAR USA INC.

PAGE: 003

MSDS NO: DQ4950CR

MATERIAL SAFETY DATA SHEET

MAINFRAME UPLOAD DATE: 08/17/06

VERSION: 017

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315  
PROD NO : 603450

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ROUTES OF ENTRY: INGESTION. INHALATION. SKIN AND EYE CONTACTS.

#### CARCINOGENICITY

STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID (OCCUPATIONAL EXPOSURES) PROVEN (HUMAN, GROUP 1, IARC) ; SUSPECTED (HUMAN, GROUP A2, ACGIH) ; GROUP A (NTP) ; CLASSIFICATION NOT APPLICABLE TO SULFURIC ACID AND SULFURIC ACID SOLUTIONS.

MUTAGENICITY NOT APPLICABLE.

TERATOGENICITY NOT APPLICABLE.

ACUTE EFFECTS SULFURIC (ACID): MAY BE FATAL IF INHALED OR INGESTED IN LARGE QUANTITY. LIQUIDS OR ACID MISTS : MAY PRODUCE TISSUE DAMAGE : MUCOUS MEMBRANES (EYES, MOUTH, RESPIRATORY TRACT). EXTREMELY DANGEROUS BY EYES AND SKIN CONTACT (CORROSIVE). SEVERE IRRITANT FOR EYES : INFLAMMATION (REDNESS, WATERING, ITCHING). VERY DANGEROUS IN CASE OF INHALATION (MISTS) AT HIGH CONCENTRATIONS : MAY PRODUCE SEVERE IRRITATION OF RESPIRATORY TRACT (CUGHING, SHORTNESS OF BREATH, CHOKING).

#### SECTION 4. FIRST AID MEASURES

##### EYE CONTACT

REMOVE CONTACT LENSES IF PRESENT. IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER, HOLDING EYELIDS OPEN FOR AT LEAST 15 MINUTES. CONSULT A PHYSICIAN. POSSIBILITY OF CONJUNCTIVITIS, SEVERE IRRITATION, SEVERE BURNS, PERMANENT EYE DAMAGE.

SKIN CONTACT: REMOVE CONTAMINATED CLOTHING AND SHOES AS QUICKLY AS POSSIBLE PROTECTING YOUR HANDS AND BODY. PLACE UNDER A DELUGE SHOWER FOR 15 MINUTES. FLUSH EXPOSED SKIN GENTLY AND THOROUGHLY WITH RUNNING WATER (PAY PARTICULAR ATTENTION TO : FOLDS, CREVICES, CREASES, GROIN). CALL A PHYSICIAN IF IRRITATION PERSISTS. MAY IRRITATE SKIN, CAUSE BURNS (HIGHLY CORROSIVE) AND POSSIBILITY OF SOME SCARRING.

WASH CONTAMINATED CLOTHING BEFORE REUSING. WHILE THE PATIENT IS BEING TRANSPORTED TO A MEDICAL FACILITY, CONTINUE THE APPLICATION OF COLD, WET COMPRESSES. IF MEDICAL TREATMENT MUST BE DELAYED, REPEAT THE FLUSHING WITH COLD WATER OR SOAK THE AFFECTED AREA WITH COLD WATER TO HELP REMOVE THE LAST TRACES OF SULFURIC ACID. CREAMS OR OINTMENTS SHOULD NOT BE APPLIED BEFORE OR DURING THE WASHING PHASE OF TREATMENT.

##### INHALATION

TAKE PRECAUTIONS TO AVOID SECONDARY CONTAMINATION BY RESIDUAL ACIDS. REMOVE THE PERSON TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. DIFFICULT BREATHING : GIVE OXYGEN. GET IMMEDIATE MEDICAL ATTENTION. POSSIBILITY OF DAMAGE TO THE UPPER RESPIRATORY TRACT AND LUNG TISSUES. MAINTAIN OBSERVATION OF THE PATIENT FOR DELAYED ONSET OF PULMONARY EDEMA.

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315

PROD NO : 603450

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MAY CAUSE IRRITATION TO THE UPPER RESPIRATORY TRACT : COUGHING, SORE THROAT, SHORTNESS OF BREATH.

## INGESTION

DO NOT INDUCE VOMITING. CONSCIOUS AND ALERT PERSON : RINSE MOUTH WITH WATER AND GIVE 1/2 TO 1 CUP OF WATER OR MILK TO DILUTE MATERIAL. SPONTANEOUS VOMITING : KEEP HEAD BELOW HIPS TO PREVENT ASPIRATION ; RINSE MOUTH AND GIVE 1/2 TO 1 CUP OF WATER OR MILK. UNCONSCIOUS PERSON : DO NOT INDUCE VOMITING OR GIVE ANY LIQUID. IMMEDIATELY OBTAIN MEDICAL ATTENTION.

## NOTES TO PHYSICIANS

CONTINUED WASHING OF THE AFFECTED AREA WITH COLD OR ICED WATER WILL BE HELPFUL IN REMOVING THE LAST TRACES OF SULFURIC ACID. CREAMS OR OINTMENTS SHOULD NOT BE APPLIED BEFORE OR DURING THE WASHING PHASE OF THE TREATMENT.

## SECTION 5. FIRE AND EXPLOSION DATA

FLASH POINT: NOT AVAILABLE

FLAMMABLE LIMITS: NOT AVAILABLE

AUTOIGNITION TEMPERATURE: NOT AVAILABLE

PRODUCTS OF COMBUSTION: RELEASES OF SULFUR DIOXIDE AT EXTREMELY HIGH TEMPERATURES.

FIRE HAZARD: NOT FLAMMABLE

## EXPLOSION HAZARD

REACTS WITH MOST METALS, ESPECIALLY WHEN DILUTE : HYDROGEN GAS RELEASE (EXTREMELY FLAMMABLE, EXPLOSIVE). RISK OF EXPLOSION WHEN ACID COMBINED WITH WATER ORGANIC MATERIALS OR BASE SOLUTIONS IN ENCLOSED SPACES (VACUUM TRUCKS, TANKS). FOLLOW APPROPRIATE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) CODES.

## FIRE FIGHTING (INSTRUCTIONS)

USE MEDIA APPROPRIATE FOR SURROUNDING MATERIAL. USE WATER SPRAY TO COOL CONTAINERS EXPOSED TO FIRE ; DO NOT GET WATER INSIDE CONTAINERS.

EVACUATE PERSONNEL TO A SAFE AREA. KEEP PERSONNEL REMOVED AND UPWIND OF FIRE. GENERATES HEAT UPON ADDITION OF WATER, WITH POSSIBILITY OF SPATTERING. WEAR FULL PROTECTIVE CLOTHING. RUNOFF FROM FIRE CONTROL MAY CAUSE POLLUTION. NEUTRALIZE RUN-OFF WITH LIME, SODA ASH, ETC., TO PREVENT CORROSION OF METALS AND FORMATION OF HYDROGEN GAS. WEAR SELF-CONTAINED BREATHING APPARATUS IF FUMES OR MISTS ARE PRESENT.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

PILL

REPORT NUMBER: 703

UNIVAR USA INC.

PAGE: 005

MSDS NO: DQ4950CR

MATERIAL SAFETY DATA SHEET

MAINFRAME UPLOAD DATE: 08/17/06

VERSION: 017

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315

PROD NO : 603450

REVIEW FIRE AND EXPLOSION HAZARDS AND SAFETY PRECAUTIONS BEFORE PROCEEDING WITH CLEAN UP. STOP FLOW IF POSSIBLE. SOAK UP SMALL SPILLS WITH DRY SAND, LAY OR DIATOMACEOUS EARTH.

DIKE LARGE SPILLS, AND CAUTIOUSLY DILUTE AND NEUTRALIZE WITH LIME OR SODA ASH, AND TRANSFER TO WASTE WATER TREATMENT SYSTEM. PREVENT LIQUID FROM ENTERING SEWERS, WATERWAYS, OR LOW AREAS.

IF THIS PRODUCT IS SPILLED AND NOT RECOVERED, OR IS RECOVERED AS A WASTE FOR TREATMENT OR DISPOSAL, THE REPORTABLE QUANTITY (U.S. DOT) IS 1 000 LBS (BASED ON THE SULFURIC ACID CONTENT OF THE SOLUTION SPILLED). COMPLY WITH FEDERAL, STATE, AND LOCAL REGULATIONS ON REPORTING RELEASES.

#### PERSONAL PROTECTION

REVIEW FIRE FIGHTING MEASURES AND HANDLING (PERSONNEL PROTECTION) SECTIONS BEFORE PROCEEDING WITH CLEANUP. USE APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT DURING CLEAN-UP.

#### SECTION 7. HANDLING AND STORAGE / ENGINEERING CONTROLS AND PERSONAL PROTECTION

##### HANDLING

DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING. AVOID BREATHING VAPORS OR MIST. WEAR APPROVED RESPIRATORS IF ADEQUATE VENTILATION CANNOT BE PROVIDED. WASH THOROUGHLY AFTER HANDLING. INGESTION OR INHALATION : SEEK MEDICAL ADVICE IMMEDIATELY AND PROVIDE MEDICAL PERSONNEL WITH A COPY OF THIS MSDS.

##### STORAGE

KEEP CONTAINER TIGHTLY CLOSED AND CLOSURE UP (DRUM) TO PREVENT LEAKAGE. DO NOT ADD WATER TO CONTENTS WHILE IN CONTAINER BECAUSE OF VIOLENT REACTION. KEEP OUT OF SUN AND AWAY FROM HEAT, SPARKS, AND FLAME. LOOSEN CLOSURE CAREFULLY. RELIEVE INTERNAL PRESSURE WHEN RECEIVED AND AT LEAST WEEKLY THEREAFTER. DO NOT USE PRESSURE TO EMPTY. BE SURE CLOSURE IS SECURELY FASTENED BEFORE MOVING CONTAINER. DO NOT WASH OUT CONTAINER OR USE IT FOR OTHER PURPOSES ; REPLACE CLOSURE AFTER EACH WITHDRAWAL AND RETURN IT WITH EMPTY CONTAINER.

#### SECTION 8. ENGINEERING CONTROLS AND PERSONAL PROTECTION

##### ENGINEERING CONTROLS

GOOD GENERAL VENTILATION SHOULD BE PROVIDED TO KEEP VAPOR AND MIST CONCENTRATIONS BELOW THE EXPOSURE LIMITS.

##### PERSONAL PROTECTION

CHEMICAL SPLASH GOGGLES ; FULL-LENGTH FACE SHIELD/CHEMICAL SPLASH GOGGLES COMBINATION ; ACID-PROOF GAUNTLET GLOVES, APRON, AND BOOTS ; LONG SLEEVE CLOTHING, ACRYLIC, OR POLYESTER CLOTHING ; ACID PROOF SUIT AND HOOD ; APPROPRIATE RESPIRATORY PROTECTION.

IN CASE OF EMERGENCY OR WHERE THERE IS A STRONG POSSIBILITY OF CONSIDERABLE

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315

PROD NO : 603450

EXPOSURE, WEAR A COMPLETE ACID SUIT WITH HOOD, BOOTS, AND GLOVES. IF ACID VAPOR OR MIST ARE PRESENT AND EXPOSURE LIMITS MAY BE EXCEEDED, WEAR APPROPRIATE NIOSH RESPIRATORY PROTECTION.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE AND APPEARANCE LIQUID (OILY ; CLEAR TO TURBID)  
 ODOR ODORLESS  
 MOLECULAR WEIGHT 98.08  
 COLOR COLORLESS TO LIGHT GREY  
 VAPOR PRESSURE @ 20 C (1% SOLN/WATER) < 1  
 VOLATILITY < 1 (BUTYL ACETATE = 1.0)  
 BOILING POINT 193 DEG C TO 327 DEG C (379 DEG F TO 621 DEG F) (0.760 MM HG)  
 VAPOR DENSITY 3.4  
 MELTING POINT -35 DEG C TO 11 DEG C (-31 DEG F TO 52 DEG F)  
 DISPERSION YES (WATER)  
 VAPOR PRESSURE < 0.3 MM HG @ 25 DEG C (77 DEG F)  
 SOLUBILITY YES (WATER) < 0.6 MM HG 38 DEG C (100 DEG F)

GRADE	BOILING POINT		FREEZING POINT		SPECIFIC GRAVITY		
	DEG	DEG C	DEG	DEG F	DEG	DEG F	
50 DEG TECHNICAL	193		380		- 12	10	1.706
66 DEG TECHNICAL	279		535		- 35	- 31	1.835
1.835 ELECTROLYTE	279		535		- 35	- 31	1.835
18 % TECHNICAL	327		621		- 2	29	1.844
99 % TECHNICAL	310		590		4	40	1.842
100 % TECHNICAL	274		526		11	51	1.839

SECTION 10. STABILITY AND REACTIVITY DATA

STABILITY YES

CONDITIONS OF INSTABILITY

REACTS VIOLENTLY WITH WATER AND ORGANIC MATERIALS WITH EVOLUTION OF HEAT.

POLYMERIZATION

POLYMERIZATION WILL NOT OCCUR.

INCOMPATIBILITIES

VIGOROUS REACTIONS WITH : WATER; ALKALINE SOLUTIONS ; METALS, METAL POWDER ; CARBIDES ; CHLORATES ; FULMINATES ; NITRATES ; PICRATES ; STRONG OXIDIZING, REDUCING, OR COMBUSTIBLE ORGANIC MATERIALS. HAZARDOUS GASES ARE EVOLVED ON CONTACT WITH CHEMICALS SUCH AS CYANIDES, SULFIDES, AND CARBIDES.

CORROSIVITY YES

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315

PROD NO : 603450

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SECTION 11. TOXICOLOGICAL INFORMATION

## CHRONIC EFFECTS

SULFURIC (ACID) : OVEREXPOSURE TO STRONG INORGANIC MISTS CONTAINING SULFURIC ACID : POSSIBILITY OF LARYNGEAL CANCER (HSBD, IARC). TARGET ORGANS FOR ACUTE AND CHRONIC OVEREXPOSURE (NIOSH 90-117) : RESPIRATORY SYSTEM, EYES, SKIN, TEETH.

MISTS : POSSIBILITY OF IRRITATION OF THE NOSE AND THROAT WITH SNEEZING, SORE THROAT OR RUNNY NOSE. HEADACHE, NAUSEA AND WEAKNESS. GROSS OVEREXPOSURE : POSSIBILITY OF IRRITATION OF NOSE, THROAT, AND LUNGS WITH COUGH, DIFFICULTY BREATHING OR SHORTNESS OF BREATH. PULMONARY EDEMA WITH COUGH, WHEEZING, ABNORMAL LUNG SOUNDS, POSSIBLY PROGRESSING TO SEVERE SHORTNESS OF BREATH AND BLUISH DISCOLORATION OF THE SKIN ; SYMPTOMS MAY BE DELAYED. REPEATED OR PROLONGED EXPOSURE TO MISTS MAY CAUSE : CORROSION OF TEETH.

CONTACT (SKIN) : POSSIBILITY OF CORROSION, BURNS OR ULCERS. CONTACT WITH A 1% SOLUTION : POSSIBILITY OF SLIGHT IRRITATION WITH ITCHING, REDNESS OR SWELLING. REPEATED OR PROLONGED EXPOSURE (MIST) : POSSIBILITY OF IRRITATION WITH ITCHING, BURNING, REDNESS, SWELLING OR RASH.

CONTACT (EYE) : POSSIBILITY OF CORROSION OR ULCERATION (BLINDNESS MAY RESULT). REPEATED OR PROLONGED EXPOSURE (MIST) : POSSIBILITY OF EYE IRRITATION WITH TEARING, PAIN OR BLURRED VISION.

INGESTION : IMMEDIATE EFFECTS OF OVEREXPOSURE MAY INCLUDE : BURNS OF THE MOUTH, THROAT, ESOPHAGUS AND STOMACH, WITH SEVERE PAIN, BLEEDING, VOMITING, DIARRHEA AND COLLAPSE OF BLOOD PRESSURE. DAMAGE MAY APPEAR DAYS AFTER EXPOSURE.

TOXICITY : PERSONS WITH THE FOLLOWING PRE-EXISTING CONDITIONS WARRANT PARTICULAR ATTENTION :

SULFURIC (ACID) : LARYNGEAL IRRITATION.

EATING, DRINKING AND SMOKING MUST BE PROHIBITED IN AREAS WHERE THIS MATERIAL IS HANDLED AND PROCESSED. WASH HANDS AND FACE BEFORE EATING, DRINKING AND SMOKING.

## SECTION 12. ECOTOXICOLOGICAL INFORMATION

## ECOTOXICITY

AQUATIC TOXICITY : SLIGHTLY TO MODERATELY TOXIC.

BLUEGILL SUNFISH (LC50 ; 48 HOURS) : 49 MG/L (TAP WATER, 20 DEG C, CONDITIONS OF BIOASSAY NOT SPECIFIED). (HSBD).

FLOUNDER (LC50 ; 48 HOURS) : 100-330 MG/L (AERATED WATER, CONDITIONS OF BIOASSAY NOT SPECIFIED). (HSBD).

## TOXICITY TO ANIMALS

REPORT NUMBER: 703

MSDS NO: DQ4950CR

MAINFRAME UPLOAD DATE: 08/17/06

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 008

VERSION: 017

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315  
PROD NO : 603450

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EYE : TESTING INDICATES THIS MATERIAL IS CORROSIVE TO THE EYE, WHEN TESTED UNDILUTED. TESTING INDICATES THIS MATERIAL IS A MODERATE EYE IRRITANT, WHEN TESTED AS 10 % SOLUTION.

SKIN : THE CONCENTRATED COMPOUND IS CORROSIVE. TESTING INDICATES THIS MATERIAL IS A SLIGHT SKIN IRRITANT, WHEN TESTED AS 10 %SOLUTION.

SINGLE AND REPEATED EXPOSURE CAUSED : IRRITATION OF THE RESPIRATORY TRACT ; CORROSION OF THE RESPIRATORY TRACT ; LUNG DAMAGE ; LABORED BREATHING ALTERED RESPIRATORY RATE ; PULMONARY EDEMA. REPEATED EXPOSURE CAUSED : ALTERED RED BLOOD CELL COUNT.

BIODEGRADATION PRODUCTS NOT AVAILABLE

BIODEGRADATION PRODUCTS (TOXICITY) NOT APPLICABLE

REMARKS ON ENVIRONMENT

DUE TO THE PRODUCT'S COMPOSITION, PARTICULAR ATTENTION MUST BE TAKEN FOR TRANSPORTATION AND STORAGE. PROTECT FROM RAIN BECAUSE THE RUN-OFF WATER WILL BE SOME ACIDIC AND MAY BE HARMFUL TO FLORA AND FAUNA.

BOD AND COD NOT AVAILABLE

SECTION 13. DISPOSAL ARRANGEMENTS

WASTE DISPOSAL CLEANED-UP MATERIAL MAY BE AN RCRA HAZARDOUS WASTE ON DISPOSAL DUE TO THE CORROSIVITY CHARACTERISTIC. DO NOT FLUSH TO SURFACE WATER OR SANITARY SEWER SYSTEM. COMPLY WITH FEDERAL, STATE, AND LOCAL REGULATIONS. IF APPROVED. NEUTRALIZE AND TRANSFER TO WASTE TREATMENT SYSTEM.

SECTION 14. TRANSPORT INFORMATION

TDG CLASS 8 CORROSIVES  
HAZARDOUS MATERIAL CLASSIFICATION UN1830 SULFURIC ACID PG II  
SPECIAL PROVISIONS (TRANSPORT) NONE

SECTION 15 OTHER REGULATIONS

OTHER REGULATIONS

DOT (U.S.A.)/IMO

PROPER SHIPPING NAME

HAZARD CLASS

UN NO.

DOT/IMO LABEL

PACKING GROUP

REPORTABLE QUANTITY

SHIPPING CONTAINERS

EU (DIRECTIVE 67/548/EEC) :

SULFURIC ACID

8

1830

CORROSIVE

II

1000 LBS (454 KG)

TANK CARS, TANK TRUCKS, VESSEL

REPORT NUMBER: 703

MSDS NO: DQ4950CR

MAINFRAME UPLOAD DATE: 08/17/06

UNIVAR USA INC.  
MATERIAL SAFETY DATA SHEET

PAGE: 009

VERSION: 017

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315

PROD NO : 603450

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SULFURIC (ACID) : ANNEX I INDEX NUMBER : 016-020-00-8 ; EU CONSOLIDATED  
INVENTORIES : EC NUMBER 231639

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) : ON THE DOMESTIC SUBSTANCES  
LIST (DSL) ; ACCEPTABLE FOR USE UNDER THE PROVISIONS OF CEPA.

CERCLA SECTION 103 HAZARDOUS SUBSTANCES (40 CFR 302.4) ; SARA SECTION 302  
EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) : YES ; SARA SECTION 313, TOXIC  
CHEMICALS (40 CFR 372.65) ; US: TSCA INVENTORY : LISTED ;  
SULFURIC (ACID) (FINAL RQ) : 1 000 POUNDS (454 KG)

SULFURIC ACID IS SUBJECT TO REPORTING REQUIREMENTS OF SECTION 313, TITLE III  
OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA), 40 CFR  
PART 372.

CERTAIN COMPANIES MUST REPORT EMISSIONS OF SULFURIC ACID AS REQUIRED UNDER  
THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT OF  
1980 (CERCLA), 40 CFR PART 302

MORE INFORMATION CALL THE SARA HOTLINE 800-424-9346.

STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID : CHEMICAL LISTED  
EFFECTIVE MARCH 14, 2003 TO THE STATE OF CALIFORNIA, PROPOSAL 65.

SULFURIC ACID IS A CLASS B DRUG PRECURSOR UNDER HEALTH CANADA'S CONTROLLED  
DRUGS AND SUBSTANCES ACT AND PRECURSOR CONTROL REGULATIONS.

U.S. FDA FOOD BIOTERRORISM REGULATIONS : THESE REGULATIONS APPLY TO SULFURIC  
ACID WHEN BEING DISTRIBUTED, STORED OR USED FOR FOOD OR FOOD PROCESSING.

CLASSIFICATIONS HCS (U.S.A.)  
DANGEROUS MAY CAUSE CANCER  
CORROSIVE LIQUID

CLASSIFICATIONS DSCL (EEC)

35- CAUSES SEVERE BURNS

28- CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE

26- IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND  
SEEK MEDICAL ADVICE

30- NEVER ADD WATER TO THIS PRODUCT

36/37/39- WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION

45- IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE

IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).

FPA NATIONAL FIRE PROTECTION ASSOCIATION) (U.S.A.)

REACTIVITY 2 HEALTH 3 SPECIAL HAZARD ACID

HMIS RATING

REACTIVITY 2 HEALTH 3

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315

PROD NO : 603450

## SECTION 16. OTHER INFORMATION

## REFERENCES

- TLVS AND BEIS (2005). BASED ON THE DOCUMENTATION OF THE THRESHOLD LIMIT VALUES FOR CHEMICAL SUBSTANCES AND PHYSICAL AGENTS & BIOLOGICAL EXPOSURE INDICES. ACGIH, CINCINNATI, OH 2 [HTTP://WWW.ACGIH.ORG](http://www.acgih.org)
- CCOHS (2005) - CANADIAN CENTRE FOR OCCUPATIONAL HEALTH AND SAFETY 2 [HTTP://WWW.CCOHS.CA/](http://www.ccohs.ca/)
- CSST (2005) - COMMISSION DE IA SANTE ET DE IA SECURITE DU TRAVAIL (QUEBEC). SERVICE DU REPERTOIRE TOXICOLOGIQUE - [HTTP://WWW.REPTOX.CSST.QC.CA/](http://www.reptox.csst.qc.ca/)
- HSBD (2005) - HAZARDOUS SUBSTANCES DATA BANK. TOXNET NETWORK OF DATABASES IN TOXICOLOGY, HAZARDOUS CHEMICALS, AND ENVIRONMENTAL HEALTH. NLM DATABASES & ELECTRONIC RESOURCES, U.S. NATIONAL LIBRARY OF MEDICINE, NHI, 8600 ROCKVILLE PIKE, BETHESDA, MD 20894 - [HTTP://TOXNET.NLM.NIH.GOV/CGI-BIN/SIS/HTMLGEN?HSDB](http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?hsdb)
- IARC - MONOGRAPHS ON THE EVALUATION OF CARCINOGENIC RISKS TO HUMANS (COLLECTION) - [HTTP://WWW-CIE.IARC.FR/](http://www-cie.iarc.fr/) - MERCK INDEX (1999). MERCK & CO., INC, 12TH EDITION
- NIOSH U.S. (2005) - POCKET GUIDE TO CHEMICAL HAZARDS 2 [P://WWW.CDC.GOV/NIOSH/NPG/](http://www.cdc.gov/niosh/npg/)
- NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK DOCUMENTS (2004), DEVELOPED BY THE U.S. DEPARTMENT OF TRANSPORTATION, TRANSPORT CANADA, AND THE SECRETARIAT OF COMMUNICATIONS AND TRANSPORTATION OF MEXICO
- PATTY'S INDUSTRIAL HYGIENE AND TOXICOLOGY, 3RD REVISED EDITION
- REGLEMENT SUR LES PRODUITS CONTROLES (CANADA)
- RTECS ( 2005). REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES, NIOSH, CDC TOXICOLOGIE INDUSTRIELLE & INTOXICATION PROFESSIONNELLE, 3E EDITION, LAUWERYS

## GLOSSARY

- CSST : COMMISSION DE LA SANTE ET DE IA SECURITE DU TRAVAIL (QUEBEC).
- HSBD : HAZARDOUS SUBSTANCES DATA BANK.
- IARC : INTERNATIONAL AGENCY FOR RESEARCH ON CANCER.
- NIOSH : NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH.
- NTP : U.S. NATIONAL TOXICOLOGY PROGRAM.
- RTECS : REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES

BECAUSE OF ITS CORROSIVE CHARACTERISTICS AND INHERENT HAZARDS, SULFURIC ACID SHOULD NOT BE USED IN SEWER OR DRAIN CLEANERS OR ANY SIMILAR APPLICATION; REGARDLESS OF WHETHER THEY ARE FORMULATED FOR RESIDENTIAL, COMMERCIAL OR INDUSTRIAL USE. VENDOR WILL NOT KNOWINGLY SELL SULFURIC ACID TO INDIVIDUALS OR COMPANIES WHO REPACKAGE THE PRODUCT FOR SALE AS SEWER OR DRAIN CLEANERS, OR ANY OTHER SIMILAR USE.

REPORT NUMBER: 703

UNIVAR USA INC.

PAGE: 011

MSDS NO: DQ4950CR

MATERIAL SAFETY DATA SHEET

MAINFRAME UPLOAD DATE: 08/17/06

VERSION: 017

PRODUCT: SULFURIC ACID 77% - 100%

ORDER NO: 334315

PROD NO : 603450

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----- FOR ADDITIONAL INFORMATION -----

CONTACT: MSDS COORDINATOR UNIVAR USA INC.  
DURING BUSINESS HOURS, PACIFIC TIME (425)889-3400

11/09/06 15:22 PRODUCT: 603450 CUST NO: 386323 ORDER NO: 334315

----- NOTICE -----

\*\*\*\*\* UNIVAR USA INC("UNIVAR"), EXPRESSLY DISCLAIMS

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ALL EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A

-----  
ARTICULAR PURPOSE, WITH RESPECT TO THE PRODUCT OR INFORMATION PROVIDED

-----  
EIN, AND SHALL UNDER NO CIRCUMSTANCES BE LIABLE FOR INCIDENTAL OR

-----  
CONSEQUENTIAL DAMAGES. \*\*

-----  
DO NOT USE INGREDIENT INFORMATION AND/OR PERCENTAGES IN THIS MSDS AS A  
PRODUCT SPECIFICATION. FOR PRODUCT SPECIFICATION INFORMATION REFER TO A PRODUCT  
SPECIFICATION SHEET AND/OR A CERTIFICATE OF ANALYSIS. THESE CAN BE OBTAINED FROM  
OUR LOCAL UNIVAR SALES OFFICE.

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ALL INFORMATION APPEARING HEREIN IS BASED UPON DATA OBTAINED FROM THE  
MANUFACTURER AND/OR RECOGNIZED TECHNICAL SOURCES. WHILE THE INFORMATION IS  
BELIEVED TO BE ACCURATE, UNIVAR MAKES NO REPRESENTATIONS AS TO ITS ACCURACY OR  
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DETERMINE WHETHER THE PRODUCT IS SUITABLE FOR THEIR PARTICULAR PURPOSES AND THEY  
ASSUME ALL RISKS OF THEIR USE, HANDLING, AND DISPOSAL OF THE PRODUCT, OR FROM  
THE PUBLICATION OR USE OF, OR RELIANCE UPON , INFORMATION CONTAINED HEREIN.  
THIS INFORMATION RELATES ONLY TO THE PRODUCT DESIGNATED HEREIN, AND DOES NOT  
RELATE TO ITS USE IN COMBINATION WITH ANY OTHER MATERIAL OR IN ANY OTHER  
PROCESS.

\*\*\* END OF MSDS \*\*\*



- Highway Patrol  
Dial 911 or 587-2000
6. Report the fire to and request the assistance of the following Emergency offsite centers:
- Blanding Fire House and Sheriff's office:  
  
Blanding Fire  
350 West 200 South, Blanding  
Phone number is 911
  - Sheriff's Office  
297 West South Main, Monticello  
Phone number is 911 or (435) 587-2237
7. Report the fire to the State of Utah Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) immediately after notification of offsite authorities, and in any event within one hour after declaration of the emergency, if possible. This immediate notification is required because a fire in the SX building is classified as an Alert.
8. Determine other crews that may be required (see Section 4.2.2 of the Plan for a discussion of the available crews at the disposal of the Incident Commander)
9. Rescue any victims of the fire; do this only with properly trained and equipped personnel.
10. Isolate utility lines affected by the fire and shut off all valves as appropriate. See Exhibit 7 for a list and locations of the main shut-off valves.
11. Extinguish the fire and post a fire watch for flare-ups.
12. In cases where the fire is not extinguished within thirty minutes of discovery, the area must be barricaded off after extinguishing and left undisturbed until released by MSHA and DUSA management.
13. Attend to any injured persons:
- One of the following EMT-trained personnel should be contacted, if they are on-site to aid in the event of any injuries to personnel:
    - David Turk;
  - Give artificial respiration if necessary;
  - Control any bleeding;
  - In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhered to skin;
  - Treat for shock, if necessary;

- Immobilize any fractures and stabilize for transportation;
- Scan the injured person for excessive alpha prior to transporting if time allows
  - (If alpha is excessive or there is no time to scan, notify the clinic/hospital personnel and the RSO);
- The Safety Coordinator or a Safety Technician will notify the following as needed:
  - Blanding Clinic 678-2254 or 678-3434 (930 N. 400 W.)
  - San Juan Hospital, Monticello 678-2830 or 587-2116 (364 W. 1st N.)
  - Ambulance Service, Blanding Dial 911
- If the Mill ambulance is used, an attendant must ride with the injured person in addition to the driver, except where the injured person could normally be transported in a car or pickup.

14. Perform scans on personnel that may have been exposed to areas of high radiation. Perform bioassays if appropriate.

15. Notification of Mill Management

The Incident Commander will notify one of the following of all incidents, if not already alerted and part of the Emergency Response crew:

- R.E. Bartlett 435-678-2495
- D. Turk 435-678-7802 or 435-459-9786
- R. Wallace 435-459-1093

16. Notification of Corporate Management:

The Incident Commander is to call Harold Roberts, Ron Hochstein or David Frydenlund immediately.

- Harold Roberts (Executive Vice President).....303-389-4160 (office)  
303-756-9050 (home)  
303-902-2870 (cell)
- Ron Hochstein (President).....604-689-7842 (office)  
604-931-6334 (home)  
604-377-1167 (cell)
- ...David Frydenlund (Vice President).....303-628-7798 (office)  
303-221-0098 (home)  
303-808-6648 (cell)

17. Perform radiation surveys to determine if the fire has caused a dispersion of radioactive materials and record the results of the surveys. These surveys will be performed in various areas of the Mill's restricted area as well as outside of the restricted area, particularly in areas

downwind of the fire. In addition, surveys will be taken in the vicinity of the nearest residence downwind of the fire.

18. Inspect facility for damage and identify any of the following types of damage to facilities

- Structural damage that could pose a hazard to workers. Any such areas should be cordoned off as appropriate;
- Damage or disability to equipment that is required to prevent releases of radionuclides exceeding regulatory limits, to prevent exposures to radioactive materials exceeding regulatory limits or to mitigate the consequences of an accident, when:
  - The equipment is required to be available and operable when it is disabled or fails to function; and
  - No redundant equipment is available and operable to perform the required safety function.

In the event of any such damage, the Incident Commander or RSO will make a determination if it is safe for personnel to re-enter the facility or any portion of the facility or whether or not any portion of the facility must be shut down because it cannot be operated safely and in accordance with all license or permit conditions, laws and regulations;

- Damage to any licensed material or any device, container or equipment containing licensed material

19. The Incident Commander or RSO will make a determination if it is safe for personnel to re-enter the facility or any portion of the facility or whether or not a portion of the facility must remain shut down.

20. The Incident Commander will make the decision to terminate the emergency or enter recovery mode or to escalate the emergency to a different category if necessary.

21. Notification of Regulatory Agencies:

A member of Mill management or Corporate management will notify the following regulating agencies as indicated below:

- Immediate Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified:

- Immediately if the event involved byproduct, source or special nuclear material possessed by the Mill that may have caused or threatens to cause any

individual to receive doses at the levels specified in R313-15-1202(1)(a) or the release of radioactive material inside or outside of the restricted area that could cause an individual to receive an intake five times the annual permissible intake as specified in R313-15-1202(1)(b); and

- as soon as possible, but not later than 4 hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed regulatory limits or releases of licensed material that could exceed regulatory limits (events may include fires, explosions, toxic gas releases etc.) (see 10 CFR 40.60);

- 24 Hour Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified within 24 hours after the discovery of:

- any of the events listed in 10 CFR 40.60; or
- any of the events listed in R313-15-1202(2).

- Report to MSHA

Any fire at the Mill facility must be reported within 15 minutes to the MSHA -1-800-746-1553.

22. Any contaminated soil identified off of the Mill property will be cleaned up and disposed of in the Mill's tailings cells.

### 23. Written Reports

The RSO will prepare a written report of the incident for Mill files. In addition, the RSO will prepare a written report and submit it to the State of Utah Division of Radiation Control within 30 days of the incident. The written report will contain the information required by R313-15-1203(2) and 10 CFR 40.60 (c)(2), as applicable.

## APPENDIX F

### **EMERGENCY RESPONSE PROCEDURE FOR A FIRE**

**(See also Section 2.1.7 of the Emergency Response Plan)**

**(See Appendix E for a fire in the Solvent Extraction Building)**

The following steps will be followed for all fires, other than a fire in the SX building, which is addressed in Appendix E. The steps should be followed in the order set out below, unless more than one crew is mobilized, in which case some of the steps can be taken simultaneously by different crews. The Incident Commander has the authority to vary from the steps set out below if he deems it necessary in the circumstances to protect public health, safety or the environment.

1. The fire will be reported by the person first discovering the fire by dialing 185 on any telephone in the area and announcing the location of the fire over the paging system. This announcement will be repeated twice, for a total of three announcements. When the paging system cycles through, the fire siren (alternating frequency) will automatically sound for approximately forty-five seconds then automatically shut off, allowing radio communications to resume.
2. Evacuate all personnel and account for all personnel, including all contractors and visitors at the Mill and all ore, product and reagent truck drivers, in accordance with the Emergency Evacuation and Shutdown Procedure described in Appendix J.
3. Determine Incident Commander. The Incident Commander will be the Mill Manager, or in his absence the Mill Superintendent, or in the absence of both the Mill Manager and the Mill Superintendent, the RSO. Shift Foremen are in charge and are responsible for all emergency procedures until the Incident Commander arrives.
4. Mobilize the fire crew.
5. Determine other crews that may be required (see Section 4.2.2 of the Plan for a discussion of the available crews at the disposal of the Incident Commander)
6. Rescue any victims of the fire; do this only with properly trained and equipped personnel.
7. Isolate utility lines affected by the fire and shut off all valves as appropriate. See Exhibit 7 for a list and locations of the main shut-off valves.
8. Extinguish the fire and post a fire watch for flare-ups.

9. If the Incident Commander determines that the fire is not capable of being controlled by the Mill's Emergency Response crews, then Report the fire to the following Emergency offsite centers:

- Blanding Fire House and Sheriff's office:

Blanding Fire  
350 West 200 South, Blanding  
Phone number is 911

- Sheriff's Office  
297 West South Main, Monticello  
Phone number is 911 or (435) 587-2237

10. In cases where the fire is not extinguished within thirty minutes of discovery, the area must be barricaded off after extinguishing and left undisturbed until released by MSHA and DUSA management.

11. Attend to any injured persons:

- One of the following EMT-trained personnel should be contacted, if they are on-site to aid in the event of any injuries to personnel:
  - David Turk;
- Give artificial respiration if necessary;
- Control any bleeding;
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhered to skin;
- Treat for shock, if necessary;
- Immobilize any fractures and stabilize for transportation;
- Scan the injured person for excessive alpha prior to transporting if time allows
  - (If alpha is excessive or there is no time to scan, notify the clinic/hospital personnel and the Radiation Safety Office);
- The Safety Coordinator or a Safety Technician will notify the following as needed:
  - Blanding Clinic 678-2254 or 678-3434 (930 N. 400 W.)
  - San Juan Hospital, Monticello 678-2830 or 587-2116 (364 W. 1st N.)
  - Ambulance Service, Blanding Dial 911
- If the Mill ambulance is used, an attendant must ride with the injured person in addition to the driver, except where the injured person could normally be transported in a car or pickup.

12. Perform scans on personnel that may have been exposed to areas of high radiation. Perform bioassays if appropriate.



facility or whether or not any portion of the facility must be shut down because it cannot be operated safely and in accordance with all license or permit conditions, laws and regulations;

- Damage to any licensed material or any device, container or equipment containing licensed material

17. The Incident Commander or RSO will make a determination if it is safe for personnel to re-enter the facility or any portion of the facility or whether or not a portion of the facility must remain shut down

18. The Incident Commander will make the decision to terminate the emergency or enter recover mode or to escalate the emergency to a different category if necessary.

19. Notification of Regulatory Agencies:

A member of Mill management or Corporate management will notify the following regulating agencies as indicated below:

- Immediate Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified:

- Immediately if the event involved byproduct, source or special nuclear material possessed by the Mill that may have caused or threatens to cause any individual to receive doses at the levels specified in R313-15-1202(1)(a) or the release of radioactive material inside or outside of the restricted area that could cause an individual to receive an intake five times the annual permissible intake as specified in R313-15-1202(1)(b); and
- as soon as possible, but not later than 4 hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed regulatory limits or releases of licensed material that could exceed regulatory limits (events may include fires, explosions, toxic gas releases etc.) (see 10 CFR 40.60);

- 24 Hour Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified within 24 hours after the discovery of:

- any of the events listed in 10 CFR 40.60; or
- any of the events listed in R313-15-1202(2).

- Report to MSHA

Any fire at the Mill facility must be reported within 15 minutes to MSHA -1-800-746-1553 if there is an injury that has a reasonable potential to cause death.

## 20. Written Reports

The RSO will prepare a written report of the incident for Mill files.

In addition, if a report is required to be given to the State of Utah, Division of Radiation Control as indicated in paragraph 19 above, the RSO will prepare a written report and submit it to the State of Utah Division of Radiation Control within 30 days of such initial report. The written report will contain the information required by R313-15-1203(2) and 10 CFR 40.60 (c)(2), as applicable.

## APPENDIX G

### **EMERGENCY RESPONSE PROCEDURE FOR A TORNADO OR MAJOR EARTHQUAKE**

**(See also Sections 2.1.8 and 2.1.9 of the Emergency Response Plan)**

The following steps will be followed for a tornado or major earthquake. The steps should be followed in the order set out below, unless more than one crew is mobilized, in which case some of the steps can be taken simultaneously by different crews. The Incident Commander has the authority to vary from the steps set out below if he deems it necessary in the circumstances to protect public health, safety or the environment.

#### 1. In the case of a tornado

##### 1.1 If you are in a building:

- (a) Go to the center of an interior room on the lowest level away from corners, windows, doors and outside walls. Put as many walls as possible between you and the outside. Avoid areas close to process equipment and leach tanks. Avoid the SX building, if possible;
- (b) If possible get under a sturdy table or cover yourself with some sort of thick padding to protect against falling debris, in case the roof and ceiling fall; and
- (c) Crouch as low as possible to the floor, facing down; and cover your head with your hands.

##### 1.2 If you are in a vehicle

- (a) Get out immediately and go to the lowest floor of a sturdy, nearby building and follow the procedures in 1.1 above;
- (b) If it is not possible to get to a nearby sturdy building, then run to low ground away from any vehicles and trees and follow the instructions in 1.4;

##### 1.3 If you are in the Scalehouse or other similar mobile home or trailer

- (a) Get out immediately. You are safer out of the Scalehouse or similar structures than you are if you stay inside;
- (b) If possible go to the nearest sturdy building and follow the instructions in 1.1 above;
- (c) If it is not possible to go to a nearby sturdy building, seek shelter on the open ground away from the Scalehouse or other similar building and follow the instructions in 1.4.

##### 1.4 If you are out in the open

- (a) If possible, seek shelter in a sturdy building. If not, lie flat and face-down on low ground, such as in a nearby ditch or depression. Be aware of the potential for flooding;

- (b) Cover your head with your hands;
- (c) Get as far away from trees and vehicles as you can; they may be blown onto you in a tornado; and
- (d) Watch out for flying debris.

#### 1.5 After the tornado

- (a) Stay away from damaged areas unless your assistance has been specifically requested by the Incident Commander. Heavily damaged buildings and other structures could collapse at any time
- (b) Stay away from power lines and puddles with wires in them; they may still be carrying electricity;
- (c) Watch your step to avoid broken glass, nails, and other sharp objects;
- (d) Do not use any matches or lighters, in case of leaking natural gas pipes or fuel tanks nearby; and
- (e) Open cabinets cautiously. Beware of objects that can fall off the shelves;

#### 2. In case of a major earthquake

Be aware that some earthquakes are actually foreshocks and a larger earthquake might occur. Minimize your movements to a few steps to a nearby safe place as outlined below and stay there until the shaking has stopped.

##### 2.1 If you are indoors

- (a) DROP to the ground; take COVER by getting under a sturdy table or other piece of furniture; and HOLD ON until the shaking stops. If there isn't a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
- (b) Stay away from glass, windows, outside doors and walls, and anything that could fall, such as lighting fixtures, furniture or equipment;
- (c) Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, loadbearing doorway;
- (d) Stay inside until the shaking stops and if is safe to go outside; and
- (e) Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.

##### 2.2 If you are outdoors

- (a) Stay there;
- (b) Move away from buildings, streetlights and utility wires. The greatest danger exists directly outside buildings, at exits, and alongside exterior walls; and
- (c) Once in the open, stay there until the shaking stops.

### 2.3 If you are in a moving vehicle

- (a) Stop as quickly as safety permits and stay in the vehicle. Avoid stopping near or under buildings, trees, overpasses and utility wires; and
- (b) Proceed cautiously once the earthquake has stopped. Avoid roads, bridges, or ramps that might have been damaged by the earthquake.

### 2.4 After the Earthquake

- (a) Expect aftershocks. These secondary shockwaves are usually less violent than the main quake but can be strong enough to do additional damage to weakened structures and can occur in the first hours, days, weeks, or even months after the quake;
  - (b) Stay away from damaged areas unless your assistance has been specifically requested by the Incident Commander. Heavily damaged buildings and other structures could collapse at any time
  - (c) Stay away from power lines and puddles with wires in them; they may still be carrying electricity;
  - (d) Watch your step to avoid broken glass, nails, and other sharp objects; and
  - (e) Do not use any matches or lighters, in case of leaking natural gas pipes or fuel tanks nearby.
3. Determine Incident Commander. The Incident Commander will be the Mill Manager, or in his absence the Mill Superintendent, or in the absence of both the Mill Manager and the Mill Superintendent, the RSO. Shift Foremen are in charge and are responsible for all emergency procedures until the Incident Commander arrives.
  4. Evacuate the Mill facility in accordance with the procedures set out in Appendix J and account for all personnel on site.
  5. If the earthquake or tornado has caused one of the other incidents referred to in the Plan, refer to the specific procedures to be followed for that incident set out in Section 2.1 of the Plan and the applicable Appendix A through I.
  6. Determine the crews that may be required (see Section 4.2.2 of the Plan for a discussion of the available crews at the disposal of the Incident Commander)
  7. Rescue any victims of the tornado or earthquake; do this only with properly trained and equipped personnel.
  8. Isolate utility lines and turn off any valves etc necessary in order to prevent fires or explosions. See Exhibit 7 for a list and locations of the main shut-off valves.

9. Attend to any injured persons:

- One of the following EMT-trained personnel should be contacted, if they are on-site to aid in the event of any injuries to personnel:
  - David Turk;
- Give artificial respiration, if necessary;
- Control any bleeding;
- Treat for shock, if necessary;
- Immobilize any fractures and stabilize for transportation;
- Scan the injured person for excessive alpha prior to transporting if time allows
  - (If alpha is excessive or there is no time to scan, notify the clinic/hospital personnel and the Radiation Safety Office);
- The Safety Coordinator or a Safety Technician will notify the following as needed:
  - Blanding Clinic 678-2254 or 678-3434 (930 N. 400 W.)
  - San Juan Hospital, Monticello 678-2830 or 587-2116 (364 W. 1st N.)
  - Ambulance Service, Blanding Dial 911
- If the Mill ambulance is used, an attendant must ride with the injured person in addition to the driver, except where the injured person could normally be transported in a car or pickup.

10. Perform scans on personnel that may have been exposed to areas of high radiation. Perform bioassays if appropriate.

11. Notification of Mill Management

The Incident Commander will notify one of the following of all incidents, if not already alerted and part of the Emergency Response crew:

- R.E. Bartlett 435-678-2495
- D. Turk 435-678-7802 or 435-459-9786
- R. Wallace 435-459-1093

12. Notification of Corporate Management:

The Incident Commander is to call Harold Roberts, Ron Hochstein or David Frydenlund immediately.

- Harold Roberts (Executive Vice President).....303-389-4160 (office)  
303-756-9050 (home)  
303-902-2870 (cell)
- Ron Hochstein (President).....604-689-7842 (office)  
604-931-6334 (home)  
604-377-1167 (cell)



## 17. Notification of Regulatory Agencies:

A member of Mill management or Corporate management will notify the following regulating agencies as indicated below:

- Immediate Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified:

- Immediately if the event involved byproduct, source or special nuclear material possessed by the Mill that may have caused or threatens to cause any individual to receive doses at the levels specified in R313-15-1202(1)(a) or the release of radioactive material inside or outside of the restricted area that could cause an individual to receive an intake five times the annual permissible intake as specified in R313-15-1202(1)(b); and
- as soon as possible, but not later than 4 hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed regulatory limits or releases of licensed material that could exceed regulatory limits (events may include fires, explosions, toxic gas releases etc.) (see 10 CFR 40.60)

- 24 Hour Report to UDEQ may be necessary

The State of Utah, Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123) must be notified within 24 hours after the discovery of:

- any of the events listed in 10 CFR 40.60; or
- any of the events listed in R313-15-1202(2).

- Report to MSHA

Any tornado or major earthquake that resulted in structural damage or potentially life threatening injuries at the Mill facility must be reported within 15 minutes to MSHA -1-800-746-1553.

18. Any contaminated soil identified off of the Mill property will be cleaned up and disposed of in the Mill's tailings cells.

## 19. Written Reports

The RSO will prepare a written report of the incident for Mill files. In addition, if a report has been given to the State under paragraph 17 above, the RSO will prepare a written report and submit it to the State of Utah Division of Radiation Control within 30 days of the

incident. The written report will contain the information required by R313-15-1203(2) and 10 CFR 40.60 (c)(2), as applicable.

## APPENDIX H

### EMERGENCY RESPONSE PROCEDURE FOR TAILINGS ACCIDENTS

(See also Sections 2.1.10.1, 2.1.10.2 and 2.1.10.3 of the Emergency Response Plan

The following steps will be followed in the event of a tailings accident (flood water breaching, structural failure of tailings dike or damage to tailings transport system). The steps should be followed in the order set out below, unless more than one crew is mobilized, in which case some of the steps can be taken simultaneously by different crews. The Incident Commander has the authority to vary from the steps set out below if he deems it necessary in the circumstances to protect public health, safety or the environment.

1. The person who first witnesses the tailings accident should immediately contact his or her supervisor, who will initiate the procedures set out below.
2. Evacuate personnel from areas around the impacted area as necessary to prevent possible injury to those personnel. Access to those areas will be limited to authorized personnel.
3. Turn off all feed of tailings or solutions to the tailings cells and to the tailings transport system.
4. Determine Incident Commander. The Incident Commander will be the Mill Manager, or in his absence the Mill Superintendent, or in the absence of both the Mill Manager and the Mill Superintendent, the RSO. Shift Foremen are in charge and are responsible for all emergency procedures until the Incident Commander arrives.
5. Notification of Mill Management

The Supervisor will notify one of the following if not already alerted and part of the Emergency Response crew:

- R.E. Bartlett      435-678-2495
  - D. Turk            435-678-7802 or 435-459-9786
  - R. Wallace        435-459-1093
6. To the extent possible, solutions from an impacted tailings cell will be pumped to an un-impacted tailings cell.
  7. Notification of Corporate Management:

The Incident Commander is to call Harold Roberts, Ron Hochstein or David Frydenlund immediately.

- Harold Roberts (Executive Vice President).....303-389-4160 (office)  
303-756-9050 (home)  
303-902-2870 (cell)
- Ron Hochstein (President)..... 604-689-7842 (office)  
604-931-6334 (home)  
604-377-1167 (cell)
- ...David Frydenlund (Vice President).....303-628-7798 (office)  
303-221-0098 (home)  
303-808-6648 (cell)

8. In the event of damage to the transport system, the system will be shut down and repaired. Any spills will be cleaned up and deposited in the tailings cells.

9. In the case of flood water breaching the retention system or structural failure of the tailings dikes, mobilize large operating equipment to construct temporary earthen dikes or berms downgradient to the impacted dike, if appropriate in the circumstances.

10. In the case of flood water breaching the retention system or structural failure of the tailings dikes, report the incident as soon as possible, and in any event within 24 hours of the discovery of the incident to:

- the State of Utah Division of Radiation Control (801-536-4250 during business hours or after hours to the UDEQ Duty Officer at 801-536-4123);
- the State of Utah Division of Water Quality, Groundwater Protection Section (801-538-6146 during business hours or after hours to the UDEQ 24-hour number at 801-538-6333); and
- State of Utah, Natural Resources, Dam Safety (801-538-7200).

11. Take other measures and perform remediation work as necessary and in accordance with advice and instructions of the State of Utah Division of Radiation Control.

12. Other reporting

Where a verbal report has been given under paragraph 10, a written report will be made to the State of Utah Division of Radiation Control and Division of Water Quality within 5 days after the incident.





10. The Site Incident Commander will make the decision to terminate the emergency or enter into recover mode or to escalate the emergency to a different category if necessary.

## APPENDIX J

### EMERGENCY EVACUATION AND SHUT DOWN PROCEDURE

1. Activate evacuation alarm by using the "dial 184" notification system. Evacuate and account for all personnel.
2. Personnel are to assemble in one of the following areas:
  - The parking lot south of the office building;
  - The scalehouse;
  - The north side of Tailings Cell 1, or
  - North of the Mill.

The area will be designated by the Incident Commander or Shift Foreman.

#### 3. Specific Procedure for Operations Personnel

- See specific emergency shutdown procedure for Operations by area under the relevant Operating Procedure for your area.
  - A list of the main shut-off valves and their locations is set out in Exhibit 7 to the Plan.
- All employees not mentioned under Operating Procedures are to immediately report to the assembly area and congregate by crew so that all persons can be accounted for. As employees leave their work areas, they must pass the word to evacuate to any persons who may not be aware of the emergency.
- After the Mill has been determined to be safe for re-entry, employees will be verbally notified to return to their work stations.



INTERNATIONAL  
URANIUM (USA)  
CORPORATION

6425 S. Hwy. 191 • P.O. Box 809 • Blanding, UT 84511 • 435-678-2221 (phone) • 435-678-2224 (fax)

June 21, 2004

Risk Management Plan (RMP) Reporting Center  
C/o CSC  
Suite 300  
8400 Corporate Drive  
New Carrollton, MD 20785

Re: Changes/Updates to the Risk Management Plan for International Uranium (USA)  
Corporation in Blanding, Utah

To Whom It May Concern:

Pursuant to the provisions of 40 CFR 68.190, enclosed is the five-year re-submission of the RMP for International Uranium (IUSA) Corporation's White Mesa Uranium extraction Mill, located in Blanding Utah. This letter is to certify that the information, to the best of my knowledge, and belief formed after reasonable inquiry, submitted herein is true, accurate, and complete.

Sincerely,

A handwritten signature in black ink that reads "Ron Berg". The signature is written in a cursive style with a long, sweeping tail on the letter 'g'.

Ron E. Berg  
Environmental Manager

Cc: Ron Hochstein, IUSA  
Dave Frydenlund, IUSA

## Section 1. Registration Information

1.1 Source Identification: There were no reportable accidents in the last 5 years.

a. Facility Name: WHITE MESA URANIUM MILL  
b. Parent Company #1 Name: INTERNATION URANIUM CORP.  
c. Parent Company #2 Name: IUC

1.2 EPA Facility Identifier:

1.3 Other EPA Systems Facility Identifier:

1.4 Dun and Bradstreet Numbers (DUNS):

a. Facility DUNS: 082658865  
b. Parent Company #1 DUNS:  
c. Parent Company #2 DUNS:

1.5 Facility Location Address:

a. Street 1: 6425 S. HWY. 191  
b. Street 2:  
c. City: BLANDING d. State: UT e. Zip: 84115 -  
f. County: San Juan

Facility Latitude and Longitude:

g. Lat. (ddmmss.s): 37 34 15.0 h. Long. (ddmmss.s): -109 28 41.0  
i. Lat/Long Method: P1 Public Land Survey - Section  
j. Lat/Long Description: AB Administrative Building

1.6 Owner or Operator:

a. Name: INTERNATIONAL URANIUM CORP.  
b. Phone: (303) 628-7798

Mailing address:

c. Street 1: 1050 17TH SUITE 950 d. Street 2:  
e. City: DENVER f. State: CO g. Zip: 80265 -

1.7 Name and title of person or position responsible for part 68 (RMP) implementation:

a. Name of person: RON BERG  
b. Title of person or position: ENVIRONMENTAL MANAGER

**1.8 Emergency contact:**

a. Name: RON BERG  
b. Title: SITE ENVIRONMENTAL MANAGER  
c. Phone: (435) 678-2221  
d. 24-hour phone: (303) 628-7798  
e. Ext. or PIN:

**1.9 Other points of contact:**

a. Facility or Parent Company E-Mail Address: RBERG@CITLINK.NET  
b. Facility Public Contact Phone: (435) 678-2221  
c. Facility or Parent Company WWW Homepage Address:

**1.10 LEPC:** San Juan County LEPC

**1.11 Number of full time employees on site:** 95

**1.12 Covered by:**

a. OSHA PSM: No  
b. EPCRA 302: No  
c. CAA Title V: Yes Air Operating Permit ID: 11205

**1.13 OSHA Star or Merit Ranking:** No

**1.14 Last Safety Inspection (by an External Agency) Date:** 06/17/2004

**1.15 Last Safety Inspection Performed by an External Agency:** MSHA

**1.16 Will this RMP involve predictive filing?:** No

## Section 1.17 Process(es)

a. Process ID: 1      Program Level 2      URANIUM EXTRACTION

b. NAICS Code

21229      Other Metal Ore Mining

c. Process Chemicals

c.1 Chemical Name	c.2 CAS Nr.	c.3 Qty (lbs.)
Ammonia (anhydrous)	7664-41-7	280,000

a. Process ID: 2      Program Level 2

b. NAICS Code

212299      All Other Metal Ore Mining

c. Process Chemicals

c.1 Chemical Name	c.2 CAS Nr.	c.3 Qty (lbs.)
Propane	74-98-6	110,000

## Section 2. Toxics: Worst Case

Toxics: Worst Case ID: 1

2.1 a. Chemical Name: Ammonia (anhydrous)

b. Percent Weight of Chemical (if in a mixture):

2.2 Physical State: Gas Liquified by Pressure

2.3 Model used: EPA's RMP\*Comp(TM)

2.4 Scenario: Liquid spill & Vaporization

2.5 Quantity released: 140,000 lbs

2.6 Release rate: 14,000.0 lbs/min

2.7 Release duration: 10.0 mins

2.8 Wind speed: 1.5 m/sec

2.9 Atmospheric Stability Class: F

2.10 Topography: Rural

2.11 Distance to Endpoint: 12.00 mi

2.12 Estimated residential population within distance to endpoint: 4,500

2.13 Public receptors within distance to endpoint:

a. Schools:	Yes	d. Prisons/Correction facilities:	Yes
b. Residences:	Yes	e. Recreation areas:	Yes
c. Hospitals:	Yes	f. Major commercial, office, or industrial areas:	No
g. Other (Specify):			

**2.14 Environmental receptors within distance to endpoint:**

- a. National or state parks, forests, or monuments: Yes
- b. Officially designated wildlife sanctuaries, preserves, or refuges: No
- c. Federal wilderness areas: No
- d. Other (Specify):

**2.15 Passive mitigation considered:**

- a. Dikes: Yes
- b. Enclosures: No
- c. Berms: Yes
- d. Drains: No
- e. Sumps: No
- f. Other (Specify):

**2.16 Graphic file name:**

### Section 3. Toxics: Alternative Release

**Toxics: Alternative Release ID: 1**

**3.1 a. Chemical Name:** Ammonia (anhydrous)

**b. Percent Weight of Chemical (if in a mixture):**

**3.2 Physical State:** Gas Liquified by Pressure

**3.3 Model used:** EPA's RMP\*Comp(TM)

**3.4 Scenario:** Transfer hose failure

**3.5 Quantity released:** 500 lbs

**3.6 Release rate:** 500.0 lbs/min

**3.7 Release duration:** 1.0 mins

**3.8 Wind speed:** 1.5 m/sec

**3.9 Atmospheric Stability Class:** F

**3.10 Topography:** Rural

**3.11 Distance to Endpoint:** 0.80 mi

**3.12 Estimated residential population within distance to endpoint:** 0

**3.13 Public receptors within distance to endpoint:**

- a. Schools: No
- b. Residences: Yes
- c. Hospitals: No
- d. Prisons/Correction facilities: No
- e. Recreation areas: No
- f. Major commercial, office, or industrial areas: No
- g. Other (Specify):

**3.14 Environmental receptors within distance to endpoint:**

- a. National or state parks, forests, or monuments: No
- b. Officially designated wildlife sanctuaries, preserves, or refuges: No
- c. Federal wilderness areas: No
- d. Other (Specify):

3.15 Passive mitigation considered:

a. Dikes: Yes      d. Drains: Yes  
b. Enclosures: No      e. Sumps: Yes  
c. Berms: Yes      f. Other (Specify):

3.16 Active mitigation considered:

a. Sprinkler systems: No      f. Flares: No  
b. Deluge system: Yes      g. Scrubbers: No  
c. Water curtain: No      h. Emergency shutdown systems: No  
d. Neutralization: No      i. Other (Specify):  
e. Excess flow valve: No

3.17 Graphic file name:

## Section 4. Flammables: Worst Case

Flammables: Worst Case ID: 1

4.1 Chemical Name: Propane

4.2 Model used: EPA's RMP\*Comp(TM)

4.3 Scenario: Vapor Cloud Explosion

4.4 Quantity released: 110,000 lbs

4.5 Endpoint used: 1 PSI

4.6 Distance to Endpoint: 0.40 mi

4.7 Estimated residential population within distance to endpoint: 0

4.8 Public receptors within distance to endpoint:

a. Schools: No      d. Prisons/Correction facilities: No  
b. Residences: No      e. Recreation areas: No  
c. Hospitals: No      f. Major commercial, office, or industrial areas: No  
g. Other (Specify):

4.9 Environmental receptors within distance to endpoint:

a. National or state parks, forests, or monuments: No  
b. Officially designated wildlife sanctuaries, preserves, or refuges: No  
c. Federal wilderness areas: No  
d. Other (Specify):

4.10 Passive mitigation considered:

a. Blast walls: No

b. Other (Specify):

4.11 Graphic file name:

Flammables: Worst Case ID: 2

4.1 Chemical Name: Propane

4.2 Model used: EPA's RMP\*Comp(TM)

4.3 Scenario: Vapor Cloud Explosion

4.4 Quantity released: 110,000 lbs

4.5 Endpoint used: 1 PSI

4.6 Distance to Endpoint: 0.40 mi

4.7 Estimated residential population within distance to endpoint: 0

4.8 Public receptors within distance to endpoint:

a. Schools:	No	d. Prisons/Correction facilities:	No
b. Residences:	No	e. Recreation areas:	No
c. Hospitals:	No	f. Major commercial, office, or industrial areas:	No
g. Other (Specify):			

4.9 Environmental receptors within distance to endpoint:

a. National or state parks, forests, or monuments:	No
b. Officially designated wildlife sanctuaries, preserves, or refuges:	No
c. Federal wilderness areas:	No
d. Other (Specify):	

4.10 Passive mitigation considered:

a. Blast walls:	No
b. Other (Specify):	

4.11 Graphic file name:

## Section 5. Flammables: Alternative Release

Flammables: Alternative Release ID: 1

5.1 Chemical Name: Propane

5.2 Model used: EPA's RMP\*Comp(TM)

5.3 Scenario:

Jet fire

5.4 Quantity released: 500 lbs

5.5 Endpoint used: 1 PSI

5.6 Distance to Endpoint: 0.01 mi

5.7 Estimated residential population within distance to endpoint: 0

5.8 Public receptors within distance to endpoint:

a. Schools: No d. Prisons/Correction facilities: No

b. Residences: No e. Recreation areas: No

c. Hospitals: No f. Major commercial, office, or industrial areas: No

g. Other (Specify):

5.9 Environmental receptors within distance to endpoint:

a. National or state parks, forests, or monuments: No

b. Officially designated wildlife sanctuaries, preserves, or refuges: No

c. Federal wilderness areas: No

d. Other (Specify):

5.10 Passive mitigation considered:

a. Dikes: No

b. Fire walls: No

c. Blast walls: No

d. Enclosures: No

e. Other (Specify):

5.11 Active mitigation considered:

a. Sprinkler system: No

b. Deluge systems: No

c. Water curtain: No

e. Excess flow valve: No

f. Other (Specify):

5.12 Graphic file name:

## Section 6. Accident History --- No Data To Report

## Section 7. Prevention Program 3 --- No Data To Report

## Section 8. Prevention Program 2

**Process Id:** 1 URANIUM EXTRACTION

**Prevention Program ID:** 1

**Prevention Program Description:**

**8.1 NAICS Code:** 21229

**8.2 Chemicals:** Chemical Name  
Ammonia (anhydrous)

**8.3 Safety Information:**

a. The date of the most recent review or revision of the safety information: 01/06/2004

b. Select all Federal or state regulations or industry-specific design codes and standards used to demonstrate compliance with the safety information requirement:

<b>NFPA 58 (or state law based on NFPA 58):</b>	Yes	<b>ANSI Standards:</b>	Yes
<b>OSHA (29 CFR 1910.111):</b>	No	<b>ASME Standards:</b>	Yes
<b>ASTM Standards:</b>	Yes	<b>None:</b>	No

**Other (Specify):** nrc standards

**Comments:**

**8.4 Hazard review:**

a. The date of completion of most recent hazard review or update: 03/01/2004

b. The expected or actual date of completion of all changes resulting from the hazard review:

c. Major hazards identified:

<b>Toxic release:</b>	Yes	<b>Overpressurization:</b>	Yes	<b>Earthquake:</b>	Yes
<b>Fire:</b>	Yes	<b>Corrosion:</b>	Yes	<b>Floods (flood plain):</b>	Yes
<b>Explosion:</b>	Yes	<b>Overfilling:</b>	Yes	<b>Tornado:</b>	Yes
<b>Runaway reaction:</b>	No	<b>Contamination:</b>	Yes	<b>Hurricanes:</b>	No
<b>Polymerization:</b>	No	<b>Equipment failure:</b>	Yes	<b>Other (Specify):</b>	
		<b>Loss of cooling, heating, electricity, instrument air:</b>	No		

d. Process controls in use:

<b>Vents:</b>	Yes	<b>Emergency air supply:</b>	Yes	<b>Other (Specify):</b>	
<b>Relief valves:</b>	Yes	<b>Emergency power:</b>	Yes		
<b>Check valves:</b>	Yes	<b>Backup pump:</b>	Yes		
<b>Scrubbers:</b>	Yes	<b>Grounding equipment:</b>	Yes		
<b>Flares:</b>	No	<b>Inhibitor addition:</b>	No		
<b>Manual shutoffs:</b>	Yes	<b>Rupture disks:</b>	Yes		
<b>Automatic shutoffs:</b>	Yes	<b>Excess flow device:</b>	Yes		
<b>Interlocks:</b>	Yes	<b>Quench system:</b>	Yes		
<b>Alarms and procedures:</b>	Yes	<b>Purge system:</b>	No		

Keyed bypass: No None: No

e. Mitigation systems in use:

Sprinkler system: Yes Water curtain: No  
Dikes: Yes Enclosure: No  
Fire walls: No Neutralization: No  
Blast walls: No None: No  
Deluge system: Yes Other (Specify):

f. Monitoring/detection systems in use:

Process area detectors: Yes None: No  
Perimeter monitors: No Other (specify):

g. Changes since last PHA or PHA update:

Reduction in chemical inventory: No Installation of perimeter monitoring systems: No  
Increase in chemical inventory: Yes Installation of mitigation systems: No  
Change process parameters: Yes None recommended: No  
Installation of process controls: No None: No  
Installation of process detection systems: No Other (Specify):

8.5 The date of the most recent review or revision of operating procedures: 03/30/2004

8.6 Training:

a. The date of the most recent review or revision of training programs: 01/06/2004

b. The type of training provided: Classroom: Yes On the job: Yes  
Other training (Specify): vender training

c. The type of competency testing used:

Written tests: Yes Observation: Yes  
Oral tests: No Other (Specify): discussion  
Demonstration: Yes

8.7 Maintenance:

a. The date of the most recent review or revision of maintenance procedures: 10/01/2003

b. The date of the most recent equipment inspection or test: 06/16/2004

c. Equipment most recently inspected or tested: ANHYDROUS AMMONIA, PROPANE TANKS  
VALVES, PIPING, TANK SHELL, PRESSURE RELIEF  
SYSTEM

8.8 Compliance audits:

a. The date of the most recent compliance audit (if any): 06/16/2004

b. Expected or actual date of completion of all changes resulting from the compliance audit: 06/16/2004

**8.9 Incident investigation:**

a. The date of the most recent incident investigation:

b. Expected or actual date of completion of all changes resulting from the investigation:

**8.10 The date of the most recent change that triggered a review or revision of safety information, the hazard review, operating or maintenance procedures, or training:**

02/19/2004

## Section 9. Emergency Response

**9.1 Written Emergency Response (ER) Plan:**

- a. Is facility included in written community emergency response plan? Yes
- b. Does facility have its own written emergency response plan? Yes

**9.2 Does facility's ER plan include specific actions to be taken in response to accidental releases of regulated substance(s)?** Yes

**9.3 Does facility's ER plan include procedures for informing the public and local agencies responding to accidental releases?** Yes

**9.4 Does facility's ER plan include information on emergency health care?** Yes

**9.5 Date of most recent review or update of facility's ER plan:** 04/29/2004

**9.6 Date of most recent ER training for facility's employees:** 05/20/2004

**9.7 Local agency with which facility's ER plan or response activities are coordinated:**

a. Name of agency: Blanding fire dept.

b. Telephone number: (435) 678-2313

**9.8 Subject to:**

a. OSHA Regulations at 29 CFR 1910.38: No

b. OSHA Regulations at 29 CFR 1910.120: No

c. Clean Water Act Regulations at 40 CFR 112: No

d. RCRA Regulations at 40 CFR 264, 265, and 279.52: No

e. OPA-90 Regulations at 40 CFR 112, 33 CFR 154, 49 CFR 194, or 30 CFR 254: No

f. State EPCRA Rules or Laws: No

g. Other (Specify): nuclear regulatory comm. and msha

## Executive Summary

**Accidental Release Prevention and Emergency Response Policies**

This facility follows OSHA standards, ASTM standards, ANSI standards, and ASME standards for anhydrous ammonia handling and storage. It is our policy to adhere to all applicable federal, state and local laws. If an emergency were to occur, it is our policy to utilize our own response team and notify the Blanding City Fire

Department and enlist their assistance if necessary.

**The Facility and the Regulated Substances Handled**

This facility processes uranium ores. We use anhydrous ammonia as a reagent in the extraction process. The process consists of two 140,000 pound tanks and associated valves and piping, and a propane storage tank of 110,000 pounds.

**General Accidental Release Prevention and Chemical-Specific Prevention Steps**

This facility complies with EPA's accident prevention rule and all applicable federal, state and local codes and regulations. Extensive training and inspection of all processes is routinely performed. The anhydrous ammonia process is designed, installed operated and maintained in accordance with ASTM standards, ASME standards and ANSI standards. Tanks and piping are inspected daily.

**Five Year Accident History**

We have never had any accident involving anhydrous ammonia or propane that caused deaths, injuries, property or environmental damage, evacuations, or shelterings in place.

**The Emergency Response Program**

In the event of an emergency involving our anhydrous ammonia process, it is our policy to utilize our own response team and notify the Blanding City Fire Department and enlist their assistance if necessary. We have discussed this policy with the fire department and our own response team and members of the fire department have inspected our facility. Our emergency response team trains regularly for anhydrous ammonia emergencies.

**Planned Changes to Improve Safety**

No changes are planned at this time. Our facility is routinely inspected and audited and all changes to improve safety are implemented as they are noted.

## **RMP Validation Errors --- No Data To Report**

**SPILL PREVENTION, CONTROL, AND COUNTERMEASURES  
PLAN**

**FOR CHEMICALS AND PETROLEUM PRODUCTS**

**for**

White Mesa Uranium Mill  
6425 South Highway 191  
P. O. Box 809  
Blanding, Utah 84511

February 2007

Prepared by:  
Denison Mines (USA) Corp.  
1050 17<sup>th</sup> Street, Suite 950  
Denver, Colorado 80265

## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
1.1 Objective	1
1.2 Responsibilities	2
1.3 Drainage Basins, Pathways, and Diversions	3
1.4 Description of Basins	3
1.4.1 Basin A1	3
1.4.2 Basin A2	3
1.4.3 Basin B1	3
1.4.4 Basin B2	3
1.4.5 Basin B3	4
1.4.6 Basin C	4
1.4.7 Basin D	4
1.4.8 Basin E	4
1.5 Potential Chemical Spill Sources And Spill Containment	5
1.5.1 Reagent Tanks	5
1.5.2 Ammonia	5
1.5.3 Ammonium Meta Vanadate	5
1.5.4 Caustic Storage (Sodium Hydroxide )	5
1.5.5 Sodium Carbonate	5
1.5.6 Sodium Chlorate	6
1.5.7 Sulfuric Acid	6
1.5.8 Vanadium Pentoxide	6
1.5.9 Kerosene (Organic)	6
1.6.0 Used/Waste Oil	7

<b><u>SECTION</u></b>	<b><u>PAGE</u></b>
1.6.1 Propane	7
<b>1.7 Potential Petroleum Sources And Containment</b>	<b>7</b>
<b>1.7.1. Petroleum Storage Tanks</b>	<b>7</b>
1.7.1.1. Diesel	7
<b>1.7.2 Aboveground Fuel Pump Tanks</b>	<b>8</b>
1.7.2.2 Unleaded Gasoline	8
1.7.2.3 Pump Station	8
1.7.2.4 Truck Unloading	8
<b>1.8 Spill Discovery And Remedial Action</b>	<b>8</b>
<b>1.9 Spill Incident Notifications</b>	<b>9</b>
1.9.1 External Notification	9
1.9.2 Internal Notification	11
<b>1.10 Records And Reports</b>	<b>12</b>
<b>1.11 Personnel Training And Spill Prevention Procedures</b>	<b>12</b>
1.11.1 Training Records	12
1.11.2 Monitoring Reports	13
<b>1.12 Revision</b>	<b>13</b>
<b>1.13 Summary</b>	<b>13</b>
<b>1.14 Mill Manager Approval</b>	<b>14</b>
<b>1.15 Certification by Registered Professional Engineer</b>	<b>14</b>

## LIST OF TABLES

Table 1.0	Mill Organization Chart
Table 2.0	Reagent Tank List
Table 3.0	Laboratory Chemical Inventory List
Table 4.0	Reagent Yard/Small Quantity Chemicals List
Table 5.0	Reagent Yard/Bulk Chemicals List
Table 6.0	Petroleum Products and Solvents List

## LIST OF FIGURES

Figure 1	Mill Site Layout
Figure 2	Mill Site Drainage Basins

# WHITE MESA MILL

## SPILL PREVENTION, CONTROL, AND COUNTERMEASURES PLAN FOR CHEMICALS AND PETROLEUM PRODUCTS

### 1.1 OBJECTIVE:

---

The objective of the Spill Prevention, Control, and Countermeasures (SPCC) Plan is to serve as a site-specific guideline for the prevention of and response to chemical and petroleum spills, and as a guidance document for compliance with Groundwater Discharge Permit No. UGW370004. The plan outlines spill potentials, containment areas, and drainage characteristics of the White Mesa Mill site. The plan addresses chemical spill prevention, spill potentials, spill discovery, and spill notification procedures. The Oil Pollution Prevention Sections of the Clean Water Act (40 CFR 112 to 117), also referred to as the Spill Prevention, Control, and Countermeasures ("SPCC") rules, establish requirements that apply to facilities which could reasonably be expected to discharge oil in quantities that may be harmful, as described in that Act, into or upon the navigable waters of the United States or that may affect natural resources of the United States. Section 112 states that the Act is not applicable to facilities that are not subject to the authority of the U. S. Environmental Protection Agency ("EPA") for one of the following reasons:

1. Due to its location, the facility could not reasonably be expected to discharge oil into navigable waters of, or impact natural resources of, the U.S. or
2. The facility is subject to authority of the Department of Transportation as defined in a Memorandum of Understanding ("MOU") between the Secretary of Transportation and the EPA Administrator, or
3. The facility does not exceed either the underground or the above ground storage capacity (42,000 gallons and 1,320 gallons, respectively) prescribed in the rules.

The Mill could not reasonably be expected, as described in the SPCC regulation, to discharge oil into the navigable waters, or impact natural resources, of the U.S. The Mill site was constructed with an overall grade and diversion ditch system designed to channel the non-recovered portion of any material spill to the tailings management system. Hence, it is not reasonable to expect that surface spills will ever reach navigable waters or natural resources of the U.S. or Utah.

Therefore, the SPCC reporting requirements in the Clean Water Act are not applicable to the Mill. However, as good environmental management practice, the Mill has implemented the spill management program, described in this

document, which is consistent with the intent of the Clean Water Act to the extent practicable. Although the Mill, by design, cannot directly impact navigable waters of the U.S., and as a result, spills that may occur but are retained within the site would not be "reportable", the Mill implements these practices in a good faith effort to minimize all potential sources of pollution at the site.

Storage of ores and alternate feeds on the ore pad, and containment of tailings in the Mill tailings impoundment system are not considered "spills" for the purposes of this SPCC.

Ammonia is the only chemical that has the potential to leave the site, and would do so as a vapor.

Figure 1, Site Layout Map shows a map of the mill site including the locations of the chemical tanks on-site. Figure 2 shows the basins and drainage ditch areas for the mill site. Table 1.0 is an organization chart for Mill operations. Table 2.0 lists the reagent tanks and their respective capacities. Table 3.0 lists the laboratory chemicals, their amounts, and their reportable quantities. Table 4.0 lists the operations chemicals. Table 5.0 lists the chemicals in the reagent yard, their amounts, and their reportable quantities. Table 6.0 lists the petroleum products and solvents on site.

## 1.2 RESPONSIBILITIES:

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Person in charge of facility responsible for spill prevention:

**Mr. Richard E. Bartlett**, Interim Mill Manager  
6425 South Highway 191  
Blanding, UT 84511  
(435) 678-2221 (work)  
(435) 459-2495 (home)

Person in charge of follow-up spill record keeping and/or reporting:

**Mr. David E. Turk**, Department Head, Health , Safety, and Environmental  
6425 South Highway 191  
Blanding, UT 84511  
(435) 678-2221 (work)  
(435) 678-7802 (home)

Refer to *Section 1.9 Spill Incident Notification* for a list of company personnel to be notified in case of a spill. In addition, an organizational chart is provided in Table 1.0.

### **1.3 DRAINAGE BASINS, PATHWAYS, AND DIVERSIONS:**

---

The main drainage pathways are illustrated in Figure 2. The map shows drainage basin boundaries, flow paths, constructed diversion ditches, tailings cells, the spillway between Cell 2 and 3, dikes, berms, and other relevant features. The White Mesa Mill is a "zero" discharge facility for process liquid wastes. The mill area has been designed to ensure that all spills or leaks from tanks will drain toward the lined tailings cells.

The tailings cells, in turn, are operated with sufficient freeboard (minimum of three feet) to withstand 100% of the PMP (Probable Maximum Precipitation). This allows for a maximum of 10 inches of rain at any given time.

### **1.4 DESCRIPTION OF BASINS:**

---

Precipitation and unexpected spills on the mill property are contained within their respective drainage basins. Runoff would ultimately drain into one of the three (3) lined tailings cells.

#### **1.4.1 Basin A1**

Basin A1 is north of Cell 1-I and Diversion Ditch No. 1. The basin contains 23 acres, all of which drain into Westwater Creek. This area is not affected by mill operations.

#### **1.4.2 Basin A2**

Basin A2 contains all of Cell 1-I including an area south of the Diversion Ditch No. 1. The basin covers 84 acres. Any runoff from this basin would be contained within Cell 1-I.

#### **1.4.3 Basin B1**

Basin B1 is north of the mill property and is not affected by mill operations. The basin contains 45.4 tributary acres. Runoff from this basin drains into a flood retention area by flowing through Diversion Ditch No. 2. Diversion Ditch No. 2 drains into Westwater Creek.

#### **1.4.4 Basin B2**

Basin B2 is northeast of the mill and contains only 2.6 acres. Runoff from this basin would drain into Diversion Ditch No. 3. Diversion Ditch No. 3 ultimately drains into Diversion Ditch No. 2. This basin is not affected by mill operations.

#### **1.4.5 Basin B3**

Basin B3 contains most of the mill area, buildings, ore stockpiles, process storage tanks, retention ponds, spill containment structures, pipelines, and roadways. The normal direction of flow in this basin is from the northwest to the southwest. Any runoff from this basin would drain into Cell 1-I. The basin contains 64 acres. This basin has sufficient freeboard to withstand 100% of the PMP (Probable Maximum Precipitation). This allows 10 inches of rain for any given storm event.

#### **1.4.6 Basin C**

Basin C contains all of Cell 2. The basin consists of 80.7 acres. This basin contains earth stockpiles and the heavy equipment shop. The direction of flow in this basin is to the southwest. All runoff in this basin would be channeled along the southern edge of the basin. Runoff would then flow into Cell 3 via the spillway from Cell 2 to Cell 3.

#### **1.4.7 Basin D**

Basin D contains all of Cell 3. This basin consists of 78.3 acres including a portion of the slopes of the topsoil stockpile and random stockpile. The basin contains all flows, including those caused by the PMF.

#### **1.4.8 Basin E**

Basin E contains Cell 4A and consists of 43.3 acres. All anticipated flows including those caused by the PMF will be contained within the basin and will flow directly into Cell 4A.

## **1.5 POTENTIAL CHEMICAL SPILL SOURCES AND SPILL CONTAINMENT**

---

This section details potential sources of chemical spills and "reportable quantities". For purposes of this SPCC, a "reportable quantity" will be defined as quantities listed below which could be expected to reach navigable waters of the United States. Reportable Quantities are those identified in 40 CFR Part 117 Table 117.3: "Reportable Quantities of Hazardous Substances Designated Pursuant to Section 311 of the Clean Water Act." It is not expected that any spill would reach navigable waters of the United States. However, if a spill of a volume listed below occurs, and remains on the mill site, which is the more likely scenario, then management is to be notified so that proper internal evaluations of the spill are made.

### **1.5.1 Reagent Tanks ( Tank list included in Table 2.0 )**

#### **1.5.2 Ammonia**

The ammonia storage tanks consist of two tanks with a capacity of 31,409 gallons each. The tanks are located southeast of the Mill building.

Daily monitoring of the tanks for leaks and routine integrity inspections will be conducted to minimize the hazard associated with ammonia. The reportable quantity for an ammonia spill is 7 gallons.

Ammonia spills should be treated as gaseous. Ammonia vapors will be monitored closely to minimize the hazard associated with inhalation. If vapors are detected, efforts will be made to stop or repair the leak expeditiously. Ammonia is the only chemical ( as vapor) that has the potential to leave the site.

#### **1.5.3 Ammonia Meta Vanadate**

Ammonia meta vanadate is present in the SX building as the process solutions move through the circuit to produce the vanadium end product. But, the primary focus will be on the transportation of this chemical. The reportable quantity for an ammonia meta vanadate spill is 1,000 pounds.

#### **1.5.4 Caustic Storage (Sodium Hydroxide)**

The caustic storage tank is located on a splash pad on the northwest corner of the SX building. The tank has a capacity of 19,904 gallons. The tank supports are mounted on a concrete curbed catchment pad that directs spills into the sand filter sump in the northwest corner of the SX building. The reportable quantity for a sodium hydroxide spill is 85 gallons.

### **1.5.5 Sodium Carbonate (Soda Ash)**

The soda ash solution tank has a capacity of 16,921 gallons and is located in the northeast corner of the SX building. The smaller soda ash shift tank has a capacity of 8,530 gallons and is located in the SX building. Spills will be diverted into the boiler area, and would ultimately drain into Cell 1-I. There is no reportable quantity associated with a sodium carbonate spill. ...

### **1.5.6 Sodium Chlorate**

Sodium chlorate tanks consist of two fiberglass tanks located within a dike east of the SX building. The larger tank is used for dilution purposes and has a maximum capacity of 17,700 gallons. The smaller tank serves as a storage tank and has a capacity of 10,500 gallons. Daily monitoring of the tanks for leaks and integrity inspections will be conducted to minimize the hazard associated with sodium chlorate.

Sodium chlorate that has dried and solidified becomes even more of a safety hazard due to its extremely flammable nature. The reportable quantity for a sodium chlorate spill is 400 gallons.

### **1.5.7 Sulfuric Acid**

The sulfuric acid storage tanks consist of one large tank with the capacity of 1,600,000 gallons and two smaller tanks with capacities of 269,160 gallons each.

The large tank is located in the northwest corner of mill area basin B3 and is primarily used for acid storage and unloading. The tank support for the large tank is on a mound above a depression which would contain a significant spill. All flows resulting would be channeled to Cell 1-I. The tank is equipped with a high level audible alarm which sounds prior to tank overflows. A concrete spill catchment with a sump in the back provides added containment around the base of the tank. However, the catchment basin would not be able to handle a major tank failure such as a tank rupture. The resulting overflow would flow towards Cell 1-I.

The two smaller storage tanks are located within an equal volume spill containment dike east of the mill building. The tanks are not presently in use, but are equipped with high level audible alarms.

The reportable quantity for a sulfuric acid spill is 65 gallons (1,000 pounds).

### **1.5.8 Vanadium Pentoxide**

Vanadium pentoxide is produced when vanadium is processed through the drying and fusing circuits and is not present in the vanadium circuit until after the deammoniator. Efforts will be made to minimize leaks or line breaks that may occur in processes in the circuit that contain vanadium pentoxide. Special care will be taken in the transportation of this chemical. The reportable quantity for a vanadium pentoxide spill is 1,000 pounds.

### **1.5.9 Kerosene (Organic)**

The kerosene storage area is located in the central mill yard and has a combined capacity of 10,152 gallons in three tanks. Any overflow from these three tanks would flow around the south side of the SX building and then into Cell 1-I. These tanks have drain valves which remain locked unless personnel are supervising draining operations. The reportable quantity for a kerosene spill is 100 gallons.

### **1.6.0 Used/ Waste Oil**

Used/ Waste oil for parts washing is located north of the maintenance shop in a tank and has a capacity of 5,000 gallons. The tank is contained within a concrete containment system. Ultimate disposal of the used oil is to an EPA permitted oil recycler. Any oil escaping the concrete containment system will be cleaned up. Soil contaminated with used oil will be excavated and disposed of in Cell 2.

### **1.6.1 Propane**

The propane tank is located in the northwest corner of the mill yard and has a capacity of 30,000 gallons. Daily monitoring of the tank for leaks and integrity inspections will be conducted to minimize potential hazards associated with propane leaks. Propane leaks will be reported immediately. There is no reportable quantity associated with a propane spill.

## **1.7 POTENTIAL PETROLEUM SPILL SOURCES AND CONTAINMENT**

---

This section details potential sources of petroleum spills and "reportable quantities". For purposes of this SPCC, a "reportable quantity" will be defined as quantities listed below which could be expected to reach navigable waters of the United States. It is not expected that any spill would reach navigable waters of the United States. However, if a spill of a volume listed below occurs, and remains on the mill site, which is the more likely scenario, then management is to be notified so that proper internal evaluations of the spill are made.

### **1.7.1 Petroleum Tanks**

#### **1.7.1.1 Diesel**

Two diesel storage tanks are located north of the mill building. The tanks have capacities of 250 gallons each. One of the diesel tanks is for the emergency generator. The other tank is located in the pumphouse on an elevated stand. Spillage from either tank would ultimately flow into Cell 1-I. The reportable quantity for a diesel spill is 100 gallons.

## **1.7.2 Aboveground Fuel Pump Tanks**

### **1.7.2.1 Diesel**

The diesel tank is located on the east boundary of Basin B3 and has a capacity of 6,000 gallons. The tank is contained within a concrete catchment pad. The reportable quantity for a diesel spill is 100 gallons.

### **1.7.2.2 Unleaded Gasoline**

The unleaded gasoline tank is located next to the diesel tank. The unleaded gasoline tank has a capacity of 3,000 gallons and is contained within the same containment system as the diesel tank. The reportable quantity for an unleaded gasoline spill is 100 gallons.

### **1.7.2.3 Pump Station**

Both the diesel and the unleaded gasoline tanks will be used for refueling company vehicles used around the mill site. The pump station is equipped with an emergency shut-off device in case of overflow during fueling. In addition, the station is also equipped with a piston leak detector and emergency vent. Check valves are present along with a tank monitor console with a leak detection system. The catchment is able to handle a complete failure of one tank. However, if both tanks failed the concrete catchment pad would not be able to contain the spill. In this case, a temporary berm would need to be constructed. Absorbent diapers or floor sweep would be used in an effort to limit and contain the spill. The soil would be cleaned up and placed in the authorized disposal area in Cell 2.

### **1.7.2.4 Truck Unloading**

In the event of a truck accident resulting in an overturned vehicle in the mill area, proper reporting and containment procedures will be followed when warranted, such as when oil or diesel fuel is spilled. Proper clean-up procedures will be followed to minimize or limit the spill. The spill may be temporarily bermed or localized with absorbent compounds. Any soils contaminated with diesel fuel or oil will be cleaned up and placed in the authorized disposal area in Cell 2.

## 1.8 SPILL DISCOVERY AND REMEDIAL ACTION

---

Once a chemical or petroleum spill has been detected, it is important to take measures to limit additional spillage and contain the spill that has already occurred. Chemical or petroleum spills will be handled as follows:

The Shift Foreman will direct efforts to shut down systems, if possible, to limit further release.

The Shift Foreman will also secure help if operators are requiring additional assistance to contain the spill.

The Shift Foreman is also obligated to initiate reporting procedures.

Once control measures have begun and personal danger is minimized, the Shift Foreman will notify the Production Superintendent, Maintenance Superintendent, or Mill Manager.

The Production or Maintenance Superintendent will notify the Mill Manager, who in turn will notify the Environmental Health and Safety Manager.

The Mill Manager will assess the spill and related damage and direct remedial actions. The corrective actions may include repairs, clean-up, disposal, and company notifications. Government notifications may be necessary in some cases.

If a major spill continues uncontrolled, these alternatives will be considered.:

1. Construct soil dikes or a pit using heavy equipment.
2. Construct a diversion channel into an existing pond.
3. Start pumping the spill into an existing tank or pond.
4. Plan further clean-up and decontamination measures.

## 1.9 SPILL INCIDENT NOTIFICATION

---

### 1.9.1 External Notification

As stated in Section 1.1, spills are not expected to reach navigable waters of the United States. If a spill of a "reportable quantity" occurs, then mill and corporate management must be notified and they will evaluate whether or not the following agencies must be notified:

- |   |                              |
|---|------------------------------|
| 1. EPA National Response Center   | 1-800-424-8802               |
| 2. State of Utah, Department of Environmental<br>Quality, Division of Radiation Control | 801/536-4250                 |
| 3. State of Utah<br>Water Quality Division  | 801/538-7200<br>801/538-6146 |

In case of a tailings dam failure, contact the following agencies:

- |   |              |
|---|--------------|
| 1. State of Utah, Department of Environmental<br>Quality, Division of Radiation Control | 801/536-4250 |
| 2. State of Utah, Natural Resources   | 801/538-7200 |

### 1.9.2 Internal Notification

Internal reporting requirements for incidents, spills, and significant spills are as follows:

#### **Report Immediately**

Event Criteria:

1. Release of toxic or hazardous substances
2. Fire, explosions, and accidents
3. Government investigations, information requests, or enforcement actions
4. Private actions or claims (corporate or employee)
5. Deviations from corporate policies or government requirements by management

Which have or could result in the following:

1. Death, serious injury, or adverse health effects
2. Property damage exceeding \$1,000,000

3. Government investigation or enforcement action which limits operations or assesses penalties of \$100,000 or more
4. Publicity resulted or anticipated
5. Substantial media coverage

**Report At The Beginning Of The Next Day**

Event Criteria:

1. Was reported to a government agency as required by law
2. Worker (employee or contractor) recordable injury or illness associated with a release
3. Community impact-reported or awareness
4. Publicity resulted or anticipated
5. Release exceeding the reportable quantities listed in Section 1.5, for each specific process material, waste, or by-product

In the event of a spill of a reportable quantity, the Mill Manager is required to call the Corporate Environmental Manager or the President and Chief Executive Officer. The individual first discovering the spill will report it to the Shift Foreman, Production Superintendent or Maintenance Superintendent, who will in turn ensure that the Mill Manager is notified. The Environmental Health and Safety Manager will also be contacted by the Mill Manager.

<u>Name</u>	<u>Title</u>	<u>Home Phone</u>
<b><u>Mill Personnel:</u></b>		
Richard E. Bartlett	Interim Mill Manager	(435) 678-2495
Wade Hancock	Maintenance Foreman	(435) 678-2753
David E. Turk	Environmental Health and Safety Manager	(435) 678-7802
N/A	Production Superintendent	
N/A	Maintenance Foreman	
Scot Christensen	Mill Shift Foreman	(435) 678-2015

**Corporate Personnel:**

Ronald F. Hochstein	President and Chief Operating Officer	(604) 377-1167
David C. Frydenlund	Vice President and General Counsel	(303) 221-0098

In the event the next person in the chain-of-command cannot be reached, then proceed up the chain-of-command to the next level. Table 1.0 shows the organizational chart for the mill site.

## **1.10 RECORDS AND REPORTS**

---

The following reports and records are to be maintained in Central Files by the Environmental Health and Safety Manager for inspection and review for a minimum of three years:

1. Record of site monitoring inspections
  - a. Daily Tailings Inspection Data
  - b. Weekly Tailings Inspection and Survey
  - c. Monthly Tailings Inspection, Pipeline thickness
  - d. Quarterly Tailings Inspection
2. Tank to soil potential measurements
3. Annual bulk oil and fuel tank visual inspections
4. Tank and pipeline thickness tests
5. Quarterly and annual PCB transformer inspections (if transformer contains PCBs)
6. Tank supports and foundation inspections
7. Spill Incident Reports
8. Latest revision of SPCC plan

## **1.11 PERSONNEL TRAINING AND SPILL PREVENTION PROCEDURES**

---

All new employees are instructed on spills at the time they are employed and trained. They are briefed on chemical and petroleum spill prevention and control. They are informed that leaks in piping, valves, and sudden discharges from tanks should be reported immediately. Abnormal flows from ditches or impoundments are of immediate concern. In addition, a safety meeting is presented annually by the Environmental Health and Safety Manager to review the SPCC plan.

### **1.11.1 Training Records**

Employee training records on chemical and petroleum spill prevention are maintained in the general safety training files.

### **1.11.2 Monitoring Reports**

Shift logs shall provide a checklist for inspection items.

## 1.12 REVISION

---

This procedure is to be reviewed by the mill staff and a registered professional engineer at least once every three years, and updated when circumstances warrant a revision.

## 1.13 Summary

---

Below is a table listing the specific reportable quantities associated with the major chemical and petroleum products on-site.

CHEMICAL	REPORTABLE QUANTITY (RQ)
AMMONIA	100 POUNDS
AMV	1,000 POUNDS
SODIUM HYDROXIDE	1,000 POUNDS
SODA ASH	No Reportable Quantity
SODIUM CHLORATE	400 GALLONS
SULFURIC ACID	1,000 POUNDS
VANADIUM PENTOXIDE	1,000 POUNDS
KEROSENE	100 GALLONS
OIL	No Reportable Quantity
PROPANE	No Reportable Quantity
DIESEL & UNLEADED FUEL	100 GALLONS

## 1.14 MILL MANAGER APPROVAL

---

I hereby certify that I have reviewed the foregoing chemical and petroleum product SPCC plan, that I am familiar with the International Uranium (USA) Corporation White Mesa Mill facilities, and attest that this SPCC plan has been prepared in accordance with the Standard Operating Procedures currently in effect.

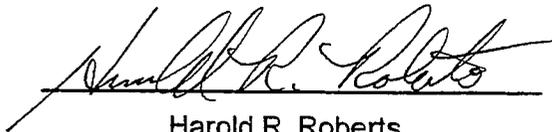


Richard E. Bartlett  
Interim Mill Manager

## 1.15 CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER

---

I hereby certify that I have reviewed the foregoing chemical and petroleum product SPCC plan, that I am familiar with the International Uranium (USA) Corporation White Mesa Mill facilities, and attest that this SPCC plan has been prepared in accordance with good engineering practices.



Harold R. Roberts  
Registered Professional Engineer  
State of Utah No. 165838



# TABLES

**Table 1  
White Mesa Mill Management Personnel  
Responsible for Implementing This BMPP**

**Mill Staff**

<u>Personnel</u>	<u>Title</u>	<u>Work Phone</u>	<u>Home Phone/ Other Contact Number</u>
Rich E. Bartlett	Interim Mill Manager	435-678-2221 Ext. 105	435 678-2495
Wade Hancock	Maintenance Foreman	435-678-2221 Ext.166	435 678-2753
Scot Christensen	Mill Foreman	435-678-2221	435 678-2015
David E. Turk	Radiation Safety Officer	435-678-2221 Ext. 113	435 678-7802

**Corporate Management Staff**

<u>Personnel</u>	<u>Title</u>	<u>Work Phone</u>	<u>Home Phone/ Other Contact Number</u>
Ron F. Hochstein	President/ Chief Operating Officer	604 806-3589	Cell: 604 377-1167
David C. Frydenlund	Vice President and General Counsel	303 389-4130	303 221-0098 Cell: 303 808-6648

**TABLE 2.0  
REAGENT TANK LIST**

QUANTITY	REAGENT	CAPACITY (GAL)
2	DIESEL	250
3	KEROSENE	10,152
1	USED/WASTE OIL	5,000
1	DIESEL	6,000
1	UNLEADED	3,000
1	PROPANE	30,000
2	AMMONIA	31,409
1	SODIUM HYDROXIDE	19,904
1	SODA ASH SOLUTION	16,921
1	SODA ASH SHIFT	8,530
1	SODIUM CHLORATE	17,700
1	SODIUM CHLORATE	10,500
1	SULFURIC ACID	1,600,000
2	SULFURIC ACID	269,160

**TABLE 3.0  
LABORATORY CHEMICAL INVENTORY LIST<sup>1</sup>**

<b>Chemical in Lab</b>	<b>RQ<sup>2</sup></b>	<b>Quantity In Stock</b>
Aluminum nitrate	2,270 kg	1.8 kg
Ammonium bifluoride	45.4 kg	2.27 kg
Ammonium chloride	2,270 kg	2.27 kg
Ammonium oxalate	2,270 kg	6.8 kg
Ammonium thiocyanate	2,270 kg	7.8 kg
Antimony potassium tartrate	45.4 kg	0.454 kg
n-Butyl acetate	2,270 kg	4 L
Carbon tetrachloride	4.54 kg	1.0 L
Cyclohexane	454 kg	24 L
Ferric chloride	454 kg	6.810 kg
Ferrous ammonium sulfate	454 kg	0.57 kg
Potassium chromate	4.54 kg	0.114 kg
Sodium nitrite	45.4 kg	2.5 kg
Sodium phosphate tribasic	2,270 kg	1.4 kg
Zinc acetate	454 kg	0.91 kg

<b>Chemical in Volatiles and Flammables Lockers (A,B,C)</b>	<b>RQ<sup>2</sup></b>	<b>Quantity In Stock</b>
Chloroform	4.54 kg	8 L
Formaldehyde	45.4 kg	<1L of 37% solution
Nitrobenzene	454 kg	12 L
Toluene	454 kg	12 L

<b>Chemical in Acid Shed</b>	<b>RQ<sup>2</sup></b>	<b>Quantity In Stock</b>
Chloroform	4.54 kg	55 gal
Hydrochloric acid	2,270 kg	58 gal
Nitric acid	454 kg	5 L
Phosphoric acid	2,270 kg	10 L
Sulfuric acid	454 kg	25 L
Hydrofluoric Acid	45.4 kg	1 L
Ammonium hydroxide	454 kg	18 L

1. This list identifies chemicals which are regulated as hazardous substances under the Federal Water Pollution Control Act 40 CFR Part 117. The lab also stores small quantities of other materials that are not hazardous substances per the above regulation.
2. Reportable Quantities are those identified in 40 CFR Part 117 Table 117.3: "Reportable Quantities of Hazardous Substances Designated Pursuant to Section 311 of the Clean Water Act."

**TABLE 4.0**  
**REAGENT YARD/SMALL QUANTITY CHEMICALS LIST <sup>1</sup>**

<b>CHEMICAL</b>	<b>RQ<sup>2</sup></b>	<b>QUANTITY IN STORAGE COMPOUND</b>
Acetic Acid, Glacial	1,000 lbs	4 gal
Ammonium Hydroxide	1,000 lbs	5L
Carbon Disulfide	100 lbs	0 lbs
Calcium Hypochlorite	10 lbs	2 kg (4.4 lbs)
Chlorine	10 lbs	0 lbs
Ferrous Sulfate Heptahydrate	1,000 lbs	5 kg (11lbs)
Hydrochloric Acid	5,000 lbs	60 gal of 40% solution
Nitric Acid	1,000 lbs	10 L
Potassium Permanganate 0.1 N	32 gal	5 kg (11 lbs)
Sodium Hypochlorite 5.5%	100 lbs	2 kg (11 lbs) of 5.5% solution
Silver Nitrate	1 lb	0 lbs
Trichloroethylene	100 lb	2 L
Xylene (Mixed Isomers)	100 lbs	0 lbs

1. This list identifies chemicals which are regulated as hazardous substances under the Federal Water Pollution Control Act 40 CFR Part 117. Materials in this list are stored in a locked storage compound near the bulk storage tank area. The Mill also stores small quantities of other materials that are not hazardous substances per the above regulation.
2. Reportable Quantities are those identified in 40 CFR Part 117 Table 117.3: "Reportable Quantities of Hazardous Substances Designated Pursuant to Section 311 of the Clean Water Act."

**TABLE 5.0  
REAGENT YARD/BULK CHEMICALS LIST<sup>1</sup>**

<b>REAGENT</b>	<b>RQ<sup>2</sup></b>	<b>QUANTITY IN REAGENT YARD</b>
Sulfuric Acid	1,000 lbs	9,000,000 lbs
Floc #301	None	1,200 lbs
Hyperfloc 102	None	1,500 lbs
Ammonia – East Tank	100 lbs	0 lbs
Ammonia – West Tank	100 lbs	105,000 lbs
Kerosene	100 gal	500 gal
Salt (Bags)	None	2,000 lbs
Ammonium Hydrogendifluoride	None	20,450 lbs
Soda Ash Dense (Bag)	None	0 lbs
Phosphoric Acid	5,000 lbs	6,300 lbs
Polyox	None	490 lbs
Millsperse	None	1,410 lbs
Nalco TX760	None	9 barrels
Nalco 7200	None	1,590 lbs
Tributyl phosphate	None	9,450 lbs
Distillates	None	100 gal
Diesel	100 gal	Approx. 3300 gal
Gasoline	100 gal	Approx. 6000 gal
Alamine 336 drums	None	0 lbs
Floc 109	None	0 lbs
Floc 208	None	0 lbs
Floc 904	None	0 lbs
Hyperfloc 624	None	0 lbs
Salt (Bulk solids)	None	0 lbs
Salt (Bulk solutions)	None	0 lbs
Caustic Soda	1,000 lbs	0 lbs
Ammonium Sulfate	None	0 lbs
Sodium Chlorate	None	20,000 lbs
Alamine 335 Bulk	None	0 lbs
Alamine 310 Bulk	None	0 lbs
Isodecanol	None	0 lbs
Vanadium Pentoxide <sup>3</sup>	1000 lbs	30,000 lbs
Yellowcake <sup>3</sup>	None	< 100,000 lbs
Ammonia Meta Vanadate	1000 lbs	0 lbs

1. This list identifies all chemicals in the reagent yard whether or not they are regulated as hazardous substances under the Federal Water Pollution Control Act 40 CFR Part 117.
2. Reportable Quantities are those identified in 40 CFR Part 117 Table 117.3: "Reportable Quantities of Hazardous Substances Designated Pursuant to Section 311 of the Clean Water Act."
3. Vanadium Pentoxide and Yellowcake, the Mill's products, are not stored in the Reagent Yard itself, but are present in closed containers in the Mill Building and/or Mill Yard.

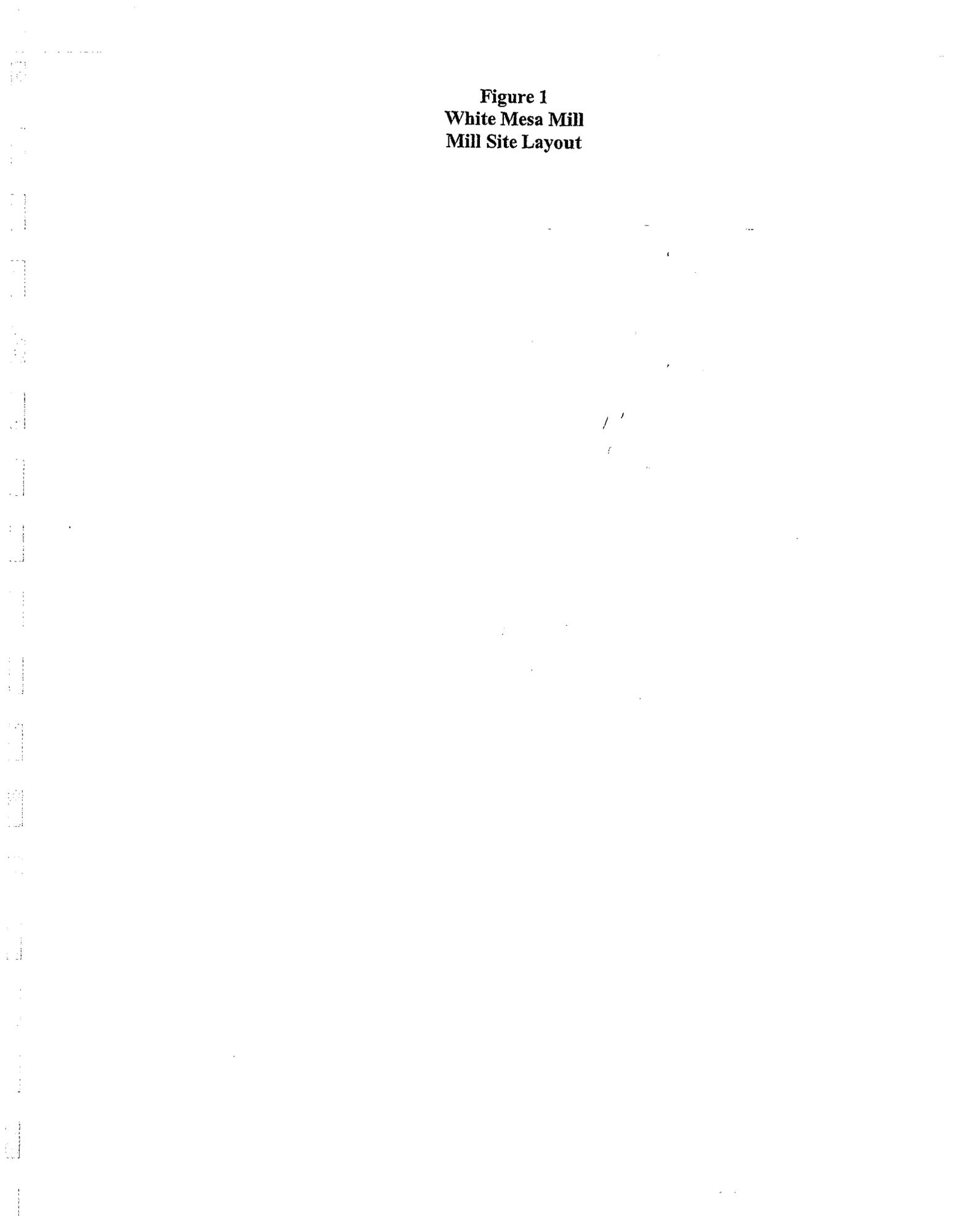
**TABLE 6.0  
PETROLEUM PRODUCTS AND SOLVENTS LIST<sup>1</sup>**

<b>PRODUCT</b>	<b>RQ</b>	<b>QUANTITY IN WAREHOUSE</b>
Lubricating Oils in 55 gallon drums	100 gal	1,540 gallons
Transmission Oils	100 gal	0 gallons
Water Soluble Oils	100 gal	30 gallons
Xylene (mixed isomers)	100 lbs	0 gallons
Toluene	1000 lbs	0 gallons
Varsol Solvent (2% trimethyl benzene in petroleum distillates)	100 gal	0 gallons

1. This list includes all solvents and petroleum-based products in the Mill warehouse petroleum and chemical storage aisles.
2. Reportable Quantities are those identified in 40 CFR Part 117 Table 117.3: "Reportable Quantities of Hazardous Substances Designated Pursuant to Section 311 of the Clean Water Act."

## FIGURES

**Figure 1**  
**White Mesa Mill**  
**Mill Site Layout**





**Figure 2**  
**White Mesa Mill**  
**Mill Site Drainage Basins**

**DENISON MINES (USA) CORP.**

**WHITE MESA URANIUM MILL**

**TRANSPORTATION ACCIDENT RESPONSE PLAN**

**For a**

**URANIUM CONCENTRATE SPILL**

## PLAN SUMMARY

### TRANSPORTATION ACCIDENT RESPONSE PLAN FOR URANIUM CONCENTRATE

Driver or carrier instructions will be given to each driver of each transport leaving the plant site with a load of uranium concentrate. These instructions will consist of an explanation of the product, preliminary precautions at the accident site, whom to notify and what to do in case of fire.

In the event of a transportation-related accident, immediate containment of the product will be achieved by covering the spill area with a plastic sheeting or equivalent material to prevent wind and water erosion. If sheeting is not available, and depending on where the spill occurs, soil from the surrounding area may be used. Perimeter ditching will be used to contain the spill if it should occur in an area where runoff could result from precipitation.

All human and vehicular traffic through the spill area will be restricted. The area would be cordoned off if possible. All persons not participating in the accident response will be restricted to 50 feet from the accident site. Local law enforcement officers will be notified and may be asked to assist in controlling traffic and keeping unauthorized persons out of the spill area.

Covered containers and removal equipment, i.e., large plastic sheeting, radioactive signs, ropes, hoses, shovels, vacuums, axes, stakes, heavy equipment (front-end loaders, graders, etc.), will be available to clean up the yellowcake. If conditions warrant, water will be applied to the spilled yellowcake in a fine spray to assist in dust abatement.

Gloves, protective clothing, and any personal clothing contaminated during cleanup operations will be encased in plastic bags and kept in the plant area for decontamination or disposal.

Response team members will have a thorough knowledge in basic first aid and of the physical hazards in inhalation, ingestion, or absorption of radionuclides. Team members will adequately protect themselves.

The cleanup operation will involve removing small amounts of pavement, topsoil and vegetation in the immediate area of the accident. The material that will have to be removed from the affected area will be returned to the mill for reprocessing, if possible, or disposed of in a manner approved by the NRC or the Executive Secretary. Following cleanup of the affected area, an alpha survey will be conducted to insure that radioactivity is within the limits outlined in NRC Guidelines for Decontamination of Facilities and Equipment prior to release for unrestricted use, dated November, 1976. An investigation will be conducted by the Radiation Protection Department. Results and recommendations of the investigation and of the decontamination survey will be documented and maintained for at least five years.

The NRC will be notified promptly of any accident of this type.

EMERGENCY RESPONSE MANUAL FOR A URANIUM CONCENTRATE SPILL  
TABLE OF CONTENTS

1.0	INTRODUCTION .....	5
1.1	Needs.....	5
1.2	Scope.....	5
a.	Initial .....	5
b.	Confinement.....	5
c.	Cleanup .....	5
d.	Cost Recovery.....	5
1.3	Description of Company Shipments .....	5
2.0	ORGANIZATION .....	6
3.0	TRAINING REQUIREMENTS .....	7
4.0	NOTIFICATION OF COMPANY PERSONNEL, GOVERNMENT AGENCIES, AND INITIAL MEDIA CONTACTS.....	7
4.1	Company or Private Carrier .....	8
4.2	D.O.T. Notification.....	8
4.3	NRC Notification.....	9
4.4	State Notification .....	9
4.5	DOE Assistance Teams.....	9
4.6	Media .....	9
5.0	EQUIPMENT .....	14
5.1	Mobilization and General Support.....	14
5.2	Containment and Personnel Protection.....	14
5.3	Radiation Monitoring/Measuring (Carried by Response Team and Stored in the White Mesa Radiation Department) .....	15
5.4	Decontamination Equipment (Carried by Response Team, Stored in White Mesa Radiation Department Storage Area):.....	16
6.0	PROCEDURES FOR HANDLING THE ACCIDENT:.....	16
6.1	Transport Vehicle Operator (Driver) .....	17
6.2	Response Team Mobilization .....	17
6.3	Emergency Containment.....	17
6.4	Protective Clothing .....	18
6.5	Radiation Measurements and Sampling.....	18
6.6	Establish Radiation Exclusion Area.....	18
6.7	Control Point.....	18
6.8	Check Station Operation .....	19
6.9	Transportation Accidents Involving IX Eluate or Uranium Product Liquor .....	19
6.10	Decontamination .....	20
6.10.1	Criteria .....	20
	<b>Acceptable Surface Contamination</b> .....	21
6.10.2	Personnel and Clothing.....	22
	Ground Areas .....	22

Equipment .....	23
<b>ADDENDUM 1 .....</b>	<b>25</b>
<b>SESSION I - CLASSROOM DISCUSSION AND DEMONSTRATION.....</b>	<b>25</b>
A. General Information.....	25
B. Biological Hazards.....	25
C. Protective Clothing and Respirators .....	25
1. Coveralls .....	25
2. Shoe Covers .....	26
3. Head Covers.....	26
4. Gloves .....	26
5. Respirators (Demonstration and Practice) .....	26
D. Radiation Monitoring and Sampling.....	27
1. Beta-Gamma Monitoring.....	27
2. Gamma Monitoring.....	28
3. Alpha Monitoring.....	28
4. Swipe Samples .....	29
5. Air Sampling.....	29
E. Contamination Control.....	30
1. Radiation Exclusion (RADEX Area).....	30
2. Control Point.....	30
3. Check Station.....	30
4. Spill Containment .....	31
F. Decontamination.....	31
1. Land Areas.....	31
2. Personnel.....	31
3. Equipment.....	32
<b>SESSION II - FIELD EXERCISE .....</b>	<b>33</b>
A. Driver Responsibilities.....	33
B. Response Team Responsibilities.....	33
<b>ADDENDUM 2.....</b>	<b>35</b>
<b>ADDENDUM 3.....</b>	<b>37</b>
1.0 Preshipment Activities .....	39
2.0 During Transport.....	39
<b>ACCIDENT REPORT.....</b>	<b>40</b>
<b>EMERGENCY INFORMATION AND PROCEDURES .....</b>	<b>41</b>

List of Figures

- 4-1 Notification Procedures for Transportation Accidents Involving Concentrate Spill
- 4-2 Accident Report Form
- 4-3 Hazardous Materials Incident Report on DOT Report Form F-5800.1 (Rev. 01/2004)

List of Tables

- 4-1 Emergency Response Plan Communication Directory

## 1.0 INTRODUCTION

### 1.1 Needs

The Nuclear Regulatory Commission requires that uranium producers implement an emergency response plan for containment and cleanup of a uranium concentrate spill. Although the DOT regulations place the responsibility for these activities on the carrier, the regulatory agencies have taken the position that the shipper has an obligation to assist because of his knowledge of the radioactive hazard of the concentrate.

### 1.2 Scope

Transportation accidents involving radioactive materials such as yellowcake consist of the following four phases:

#### a. Initial

During the first 15 to 30 minutes after the accident occurs emergency action is taken by local authorities (local or state police) to help the injured, evaluate the problem, and take action to prevent further contamination, i.e., rerouting traffic and crowd control.

#### b. Confinement

This phase is accomplished by the transport vehicle operator or local service units to complete isolation or cover the spilled material, make proper notification, and identify contaminated areas.

#### c. Cleanup

This action includes the removal of any radioactive material or contamination from the site and restoring it to original conditions. This action is the carrier's responsibility.

#### d. Cost Recovery

The cost of cleanup and liability for damage to life and property are borne by the carrier.

The Company's emergency response plan must address confinement and cleanup activities outlined above; the initial and "cost recover" phases are outside the scope of this manual.

### 1.3 Description of Company Shipments

The type of product shipped by each plant, the carrier responsible, the specific activity, and the total activity in a shipment are summarized below:

<b>Plant</b>	<b>Carrier</b>	<b>Type of Concentrate</b>	<b>Approximate Activity Per Load (Ci)/UNat</b>
White Mesa Mill	Truck Shipment	Calcined U <sub>3</sub> O <sub>8</sub>	10.16

The transportation routes for these shipments are presented in Addendum 2.

## 2.0 ORGANIZATION

The Executive Vice President - Operations is responsible for implementing this response plan. Among his duties are:

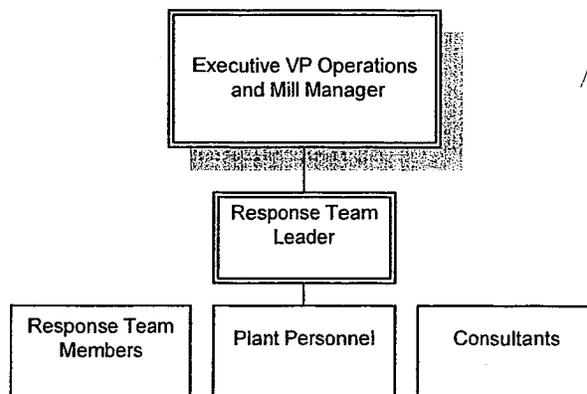
1. Notify the Mill Manager, who will subsequently notify the response team leaders, plant personnel, and consultants per procedures in Section 4.0.
2. Contact local authorities to ensure timely and clear communications with respect to incident details.
3. Notify and keep informed the President and COO
4. Direct press inquiries to the President and COO.

The other elements of the organization and their responsibilities are:

1. Mill Manager  
Designate an on-site responsible person as necessary. Coordinate the activities of the response team with those of the regulatory agencies.
2. Response Team Leader  
Supervise the cleanup and decontamination of the spill area and coordinate site activities with local, state and federal authorities.
3. Response Team Member  
Carry out the activities involved in the cleanup and decontamination as outlined in Section 6.10.
4. Plant Personnel  
Provide assistance in stabilizing the spill, if possible, and in the cleanup and decontamination operations.

5. Consultants  
Recommend procedures for the cleanup and decontamination operations and/or provide personnel and equipment for these operations.

The chain of command is shown schematically below:



### 3.0 TRAINING REQUIREMENTS

Transport vehicle operators and emergency response personnel are given a basic indoctrination with respect to radioactivity, personal protection, identification and decontamination associated with natural uranium. Additionally, a field demonstration and exercise including all emergency response personnel is conducted on a periodic basis to assure preparedness. Addendum 1 is the detailed "Emergency Response Training Outline".

### 4.0 NOTIFICATION OF COMPANY PERSONNEL, GOVERNMENT AGENCIES, AND INITIAL MEDIA CONTACTS

The key to a successful emergency response plan is good communication to and within the Company. This section provides information to assure that key Company personnel and required Governmental Agencies are properly notified of the accident. Additionally, guidance regarding release of information to the general public is provided.

Figure 4.1 shows, schematically, the notifications and critical telephone numbers required in making the contacts. Table 4-1 lists the telephone numbers for the President and COO, Executive Vice President – Operations, Mill Manager, response team leaders and members, plant personnel, consultants, and DOE assistance teams.

Figure 4-1 shows network that will be utilized to contract people and organizations in the event of an emergency involving a uranium concentrate spill. The individuals and organizations are shown on Table 4-1. Supplementary information on these procedures are presented below.

4.1 Company or Private Carrier

The accident report form, Figure 4-2, is carried by the driver with his emergency instructions. (See Addendum 3) The form should be completed prior to calling the Executive Vice President – Operations or the Mill Manager. This document provides the information required for other notifications.

4.2 DOT Notification

The DOT reporting procedures require that an accident involving hazardous materials which results in any of the following must be reported:

1. A person is killed.
2. A person requires hospitalization.
3. An evacuation of the general public occurs lasting one or more hours.
4. One or more major transportation arteries or facilities are closed or shut down for one hour or more.
5. The operational flight pattern or routine of an aircraft is altered.
6. Fire, breakage, spillage, or suspected radioactive contamination occurs following an accident involving radioactive materials.
7. A situation exists in the judgment of the carrier that there is a continuing danger to life.
8. Release; i.e. rupture of drums in excess of 0.1 Ci U-Nat (approximately 1/2 drum) constitutes a CERCLA Reportable Quantity (RQ) under 40 CFR 302 and 49 CFR 171 and requires immediate notification to the National Response Center.

As soon as practical but no later than 12 hours after the occurrence of any incident described above, each person in physical possession of the hazardous material must provide notice by telephone to the National Response Center at 800.424.8802 (toll free) or 202.267.2675 (toll call). Note that the private carriers are responsible for reporting accidents

involving their vehicles.

Hazardous Materials Incident Report on DOT Form F-5800.1 (Rev. 01/2004) must be filed within 30 days of discovery of the accident.

- 4.3 NRC and Executive Secretary Notification  
Notification must be submitted to the NRC Operations Center at 301.816.5100 and to the Executive Secretary at 801.536.4250 (after hours to the UDEQ Duty Officer at 801.536.4123) within 24 hours of an incident..
- 4.4 State Notification  
Notification to the State or States involved where the incident is involved should take place as soon as possible. Promptly recommend to authorities specific protective action to limit the danger to the public including evacuation and sheltering and the prophylactic use of potassium iodide (KI) as appropriate.
- 4.5 DOE Assistance Teams  
These teams would only be alerted in situations such as widespread contamination in a metropolitan area.
- 4.6 Media  
The responsible company representative at the accident scene will be required to make statements to the press providing general information regarding the accident and status of emergency activities. To simplify this matter during the initial stages of emergency response, a “canned” press release form, outlined below is used. State that additional comments on the status of the situation will be available later in the day. Other information released to the general public must have prior approval of the Director of Operations.

### Press Release Form for Uranium Concentrate Accident

At approximately (time) \_\_\_\_\_ on (date) \_\_\_\_\_ an accident involving a truck carrying natural uranium concentrate from Denison Mines (USA) Corp.'s White Mesa Mill occurred near (location) \_\_\_\_\_

There (were or were not) \_\_\_\_\_ injuries to the public or the driver of the truck.  
There (was or was not) \_\_\_\_\_ spillage of the concentrate from the truck.

The accident occurred at \_\_\_\_\_ near \_\_\_\_\_

If no spillage: State that your purpose is to make a routine check to insure that the shipment can continue without presenting a hazard.

If spillage has occurred: State that this group which has been trained to clean up spills of concentrate will act in cooperation with government authorities to clean up the spill as quickly as possible and that there is minimal risk to the public.

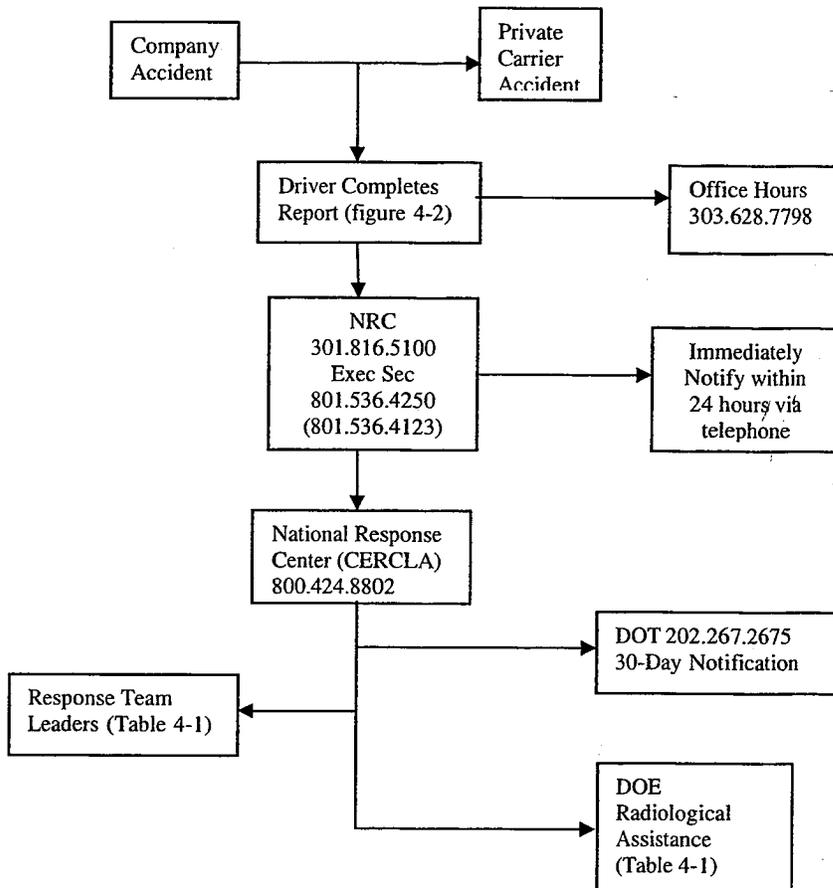


Figure 4-1: Notification Procedures for Transportation Accidents Involving Concentrate Spill

Table 4-1

**Emergency Response Plan Communications Directory**

<b>Function</b>	<b>Name</b>	<b>Daytime Phone</b>	<b>Night Contact No.</b>
President & COO	Ron F. Hochstein	604.806.3589	604.377.1167
Executive Vice President - Operations	Harold R. Roberts	303.628.7798	303.756.9050
Mill Manager	Richard E. Bartlett	435.678.2221	435.678.2495
Response Team Leaders	David Turk	435.678.2221	435.678.7802
	Michael Spillman	435.678.2221	435.678.2761
White Mesa Mill	David Turk	435.678.2221	435.678.7802
	Daniel Mower	435.678.2221	435.678.2654
	Ron Wallace	435.678.2221	
	Michael Spillman	435.678.2221	435.678.2761

DOE Radiological Team  
Idaho Operations 208-526-0111 Ext. 1515 CO, WY, UT

Albuquerque  
Operations (505) 845-4666  
TX, NM, OK, KA, AK (505) 845-4667  
Chicago Operations (708) 972-4800-Duty hours  
ND, SD, NB, IA (708) 972-5731- Off Days

**ACCIDENT REPORT**

1.0 Date \_\_\_\_\_ Time \_\_\_\_\_

2.0 Person Calling \_\_\_\_\_ Capacity \_\_\_\_\_

From Telephone No. \_\_\_\_\_ Who Else Notified \_\_\_\_\_

3.0 Accident Location \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4.0 Description of the Accident

Persons Injured \_\_\_\_\_ Name(s) \_\_\_\_\_

Treatment \_\_\_\_\_

Accident Description \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

5.0 Was Any Company Material Spilled from the Vehicle(s)? \_\_\_\_\_

\_\_\_\_\_

6.0 What Action Has Been Taken to Contain the Material? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

7.0 Please report this information to one of the following:

Monday - Friday 8:00 a.m. to 4:30 p.m. MST

Harold R. Roberts, Executive Vice President – Operations, Denver, Colorado.

Telephone No. 303-628-7798 day time, work days

Night and weekend contact Telephone No. (303) 756-9050, Cell Phone (303) 902-2870

Rich E. Bartlett, Mill Manager, White Mesa Mill, Blanding, Utah

Telephone No. 435-678-2221 day time, work days

Night and weekend contact Telephone No. (435) 678-2495

Figure 4-2

5.0 EQUIPMENT

This section lists equipment for emergency response as well as its location and intended use.

5.1 Mobilization and General Support

<u>Qty.</u>	<u>Description</u>	<u>Location</u>	<u>Use</u>
2	Pickup	Radiation Department	Equip. & Personnel
As Needed	Pool Vehicles	Office	Personnel
*1	Portable AC Generator	Radiation Department	On-Site Electricity
*4	Exten. Cord/Light (50')	Radiation Department	AC Powered Equipment
**2	Flashlights	Radiation Department	Initial Set-Up
*1	Digital Camera	Radiation Department	Documentation
1	First Aid Kit	Radiation Department	First Aid

\* Carried by Response Team

\*\* Carried by Response Team and Plant Representative

5.2 Containment and Personnel Protection

5.2.1 Carried in transport vehicle for operator use:

<u>Quantity</u>	<u>Description</u>
1	Box w/Lid
1	1,000 Ft <sup>2</sup> Plastic Sheet
1	Army Shovel
24	Spikes
1	Urethane "Dike-Pak"
1	Roll, Aluminum Tape
1	Hammer
4	Respirators, Half Mask
2	Coveralls
2	Pairs Gloves

5.2.2 Carried by Response Team (Stored in Radiation Department):

<u>Quantity</u>	<u>Description</u>
1	Plastic Sheet, 20 Ft. X 1,000 Ft.
1,000 ft.	Barricade Tape
20	Metal Stakes
4	Radiation Warning Signs
1	Urethane “Dike-Pak”
1	Water Sprayer – Portable
1 Roll	Aluminum Tape
4 Rolls	Duct Tape
6	Respirators, Full Face, Type Combo Canister
24	Coveralls, Disposable Paper
24	Pair Gloves, Plastic Impregnated
6	Pair Gloves, Rubber
24	Pair Shoe Covers
24	Head Covers, Nun Hood

5.3 Radiation Monitoring/Measuring (Carried by Response Team and Stored in the White Mesa Radiation Department)

<u>Quantity</u>	<u>Description</u>	<u>Use</u>
1	Aluminum Suitcase containing the following:	
	<u>Ludlum Instruments</u>	
1	Count Rate Meter, Model 3 (or equivalent)	Gamma, Beta, Alpha Monitoring
1	G.M. Probe, Model 44-6 (or equivalent)	Beta Monitoring
1	Na I (tl) Scintillation Probe, Model 44-2 (or equivalent)	Gamma Monitoring
1	ZnS (Ag) Scintillation Probe, Model 43-5 (or equivalent)	Gamma Monitoring
2	Geiger Counters, Portable, W/Thin Wall G.M. Probe (or equivalent)	Beta Monitoring
1	Eberline PRM-7 (or equivalent)	Gamma Monitoring
1	Set - Check Sources, Eberline (Cs-137, Te-99, Th- 230)	Instrument Operational Checks
2	Air Samplers, High-Vol. (50 Cubic Ft/Mm.), AC Powered 2/50 Each Filters	Site Air Sampling
20	Sample Bottles, Urine W/Labels	Urinalysis
50	Nose Swipes, Q-Tip, W/Envelopes	Detection of Radioactive Particle Inhalation

5.4 Decontamination Equipment (Carried by Response Team, Stored in White Mesa Office):

<u>Quantity</u>	<u>Description</u>
2	Shovels
1	Vacuum Cleaner, Pullman Model JB-75, WI Absolute Filter and Drum Adapter (or equivalent)
40	Drum Liner Bags
4	Metal Drums, 55-Gallon
2	Drum Closure Wrenches
1	Drum Cleaning Rags w/ 1 Gallon Acetone
50	D.O.T. Labels; Yellow II
1	Can Waterless Hand Cleaner
1	Wash Basins
2	Bars Soap
3	Washcloths
3	Towels

6.0 PROCEDURES FOR HANDLING THE ACCIDENT:

Vehicle accidents involving yellowcake can be categorized in three basic radiological severity types as follows:

1. No apparent release of concentrate from its drum containers (drums may or may not be outside the vehicle).
2. Concentrate is released from the drum but contained within the van.
3. Concentrate is spilled from its container outside the transport vehicle.

This characterization, as it applies to UPL shipments, consists of no apparent leakage from the tank trucks, or a spill of solution. Section 6.9 outlines the procedures for handling this type of accident.

Situations arising from each of these accident types can be highly variable depending on;

- a. Proximity of waterways and populated areas;
- b. Weather conditions at the accident site;
- c. The condition of the vehicle operator after the accident; and
- d. Availability of local emergency response personnel (police, firemen, etc.).

In view of these variables, this section is intended as a basic guide requiring certain judgmental decisions on a case-by-case basis.

### 6.1 Transport Vehicle Operator (Driver)

Filling out the accident form and notifying the Director of Operations. They will then follow the following emergency instructions carried in his kit.

- a. If there is not apparent leakage (drums may or may not be thrown from the vehicle):
  1. Caution people not to tamper with containers (use civil authorities to assist if necessary) and have them stay 10 to 15 feet away.
  2. Containers lying on the road should be moved to the road edge (if assistance can be obtained), and
  3. Assure local authorities there is no danger in handling closed containers.

### 6.2 Response Team Mobilization

The response team leader will access available accident information and assemble the required personnel at the White Mesa Mill Office. Required vehicle and facility keys are stored in the White Mesa Mill Office (labeled “Y. C. Response”). Mobilization will be accomplished in the following sequence:

- a. Obtain radiation monitoring/measuring equipment (Section 5.3),
- b. Proceed to the Radiation Department storage containers,
- c. Load emergency equipment in the vehicle (Section 5.0),
- d. Obtain pool vehicles as required to transport all personnel, and
- e. Proceed to the accident site.

The response team leader will check to make certain that available air samplers (including filters), flashlights, and Geiger counters are dispatched with the plant representative.

### 6.3 Emergency Containment

Upon arrival at the accident site inform local authorities of your presence, purpose, and proposed activities. Gather information regarding current status of activities and assign one individual to record this information as well as names

and positions of persons present at the site. If the spilled material is not stabilized, proceed with this activity in completing the procedures outlined in Section 6.1.

#### 6.4 Protective Clothing

Protective clothing is normally required when spillage is evident. The need and use for these are established by the response team leader on a case-by-case basis. Refer to Addendum 1 for details. He is also responsible for controlling, maintaining, decontamination, testing and instructing in the proper use of protective clothing and respiratory protective equipment.

#### 6.5 Radiation Measurements and Sampling

Response team members are trained in proper operation of portable radiation detectors as well as monitoring techniques (Addendum 1). Initial monitoring for spread of contamination is accomplished with portable, open window, Geiger counters. Additionally high volume air samples are located and activated 50 feet upwind and downwind from the spill.

#### 6.6 Establish Radiation Exclusion Area

The boundaries of the yellowcake spill area, whether inside the transport vehicle or outside, are defined through a combination of visual observation (identifying yellow color) and radiation monitoring (GM detectors). The area is then roped off, leaving about ten feet between the tape barricade and the spill boundary, and “Caution Radioactive Materials” signs are installed on the barricade. The barricaded area is referred to as the “radiation exclusion” (RADEX) area and unauthorized equipment or personnel are not allowed to enter.

#### 6.7 Control Point

A base of operations where needed equipment or data is stored and maintained is established outside the RADEX area (normally about ten feet away from the barricade). This base is referred to as the “control point”. The control point is also used as a debriefing area and personnel contamination station.

## 6.8 Check Station Operation

Receptacles (plastic bags) for used protective clothing and equipment are fastened to the inside tape barricade, near the “control point,” of the RADEX area. This location is used as the only area where ingress and egress to the RADEX area is allowed, and it is referred to as the “check station”. One response team member is assigned to man the check station and his responsibilities are:

- a. Assure only required people enter the area and they are properly equipped with protective clothing and respirators (Section 6.4).
- b. When personnel exit the RADEX area, make certain protective clothing is properly removed and placed in receptacles with the shoe covers being the last items removed.
- c. Monitor the person’s exposed skin areas (hands, face, etc.) and clothing using the alpha scintillation detector probe.
- d. If personal clothing monitoring reveals contamination, remove the involved clothing and monitor skin beneath it.
- e. Collect nose swipes and monitor same.
- f. If contamination is evident on nose swipes, label a urine sample bottle (name and date) and request a donation at the earliest convenience; follow up this sampling on a 24-hour basis.
- g. If monitoring reveals skin contamination, direct the individual to the personnel decontamination station.
- h. Equipment being removed from the RADEX area is monitored for alpha radiation at the check station and sealed in plastic bags or decontaminated if found contaminated.

## 6.9 Transportation Accidents Involving IX Eluate or Uranium Product Liquor

The shipment of a solution in a tank truck is less hazardous than shipping a  $U_3O_8$  concentrate. The reasons are as follows:

1. The activity released to the environment by spillage of the contents of the tank truck is approximately  $8e-3$  Ci/U-Nat per 300 gallons of solution.
2. There is no hazard from airborne material.

3. If a transportation accident occurred which resulted in the loss of the tank content, the material released would not constitute a regulatory notification as defined in 40 CFR 302 or 49 CFR 171.
4. In the event of a fire, the solution would tend to extinguish it. The type of accident that must be considered is a rupture of the vessel wall, and the resultant need to contain the spillage.

The driver carries with the truck an emergency kit which contains respirators, clothing, hammer, knife, tent pegs and 1,000 square feet of plastic sheeting. In the event of an accident he is instructed to do the following:

- a. Place the plastic sheeting under the leak.
- b. If the leak is small, try to repair it with the aluminum tape.
- c. If the leak cannot be contained by the above procedure, the foam pack will be used to build a dike over the plastic sheet which is dropped on the ground.

#### 6.10 Decontamination

This section established the criteria and procedures for personnel, ground area and equipment decontamination. Prompt decontamination is essential to avoid possible internal exposure to radioactive material.

##### 6.10.1 Criteria

Criteria presented is based on radioactive contamination resulting from an accident involving natural uranium (yellowcake) and is excerpted from the U.S. Nuclear Regulatory Commission (NRC) "guidelines" where appropriate.

##### 1. Personnel and Clothing

Personal clothing, skin and hair must not have any detectable alpha contamination as measured with the Ludlum Model 3 (or equivalent) incorporating the alpha scintillation detector probe.

##### 2. Land Areas and Equipment

The following instructions apply in all cases:

- a. A reasonable effort must be made to completely eliminate residual contamination.

- b. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified below prior to applying the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.
- c. Prior to release of equipment or abandoning the accident site, a comprehensive survey will be made and recorded to establish that contamination is within the limits specified below:

### Acceptable Surface Contamination

#### Fixed

#### Average

5,000 dpm/100 cm<sup>2</sup>  
0.2 mRad/hr @ 1 cm  
Background mR/hr

#### Maximum

15,000 dpm/100 cm<sup>2</sup>  
1.0 mRad/hr @ 1 cm  
Background mR/hr

#### Removable

1,000 dpm/100 cm<sup>2</sup>

1. Alpha measurements will be made using the Ludlum alpha scintillation probe. Multiplying observed cpm by efficiency to obtain dpm and multiplying dpm by two to convert the probe area to 100 cm<sup>2</sup>
2. Removable contamination will be determined from a dry swipe sample if the total surface area swiped is less than 100 cm<sup>2</sup>, pertinent levels must be reduced proportionally.
3. Measurements of “average” contamination should not include more than one square meter.
4. The maximum contamination level applies to an area of not more than 100 cm<sup>2</sup>
5. The acceptable mRad/hr @ 1 will be measured with the Texas Nuclear Ionization Chamber (open window) (or equivalent).
6. Background mR/hr gamma is measured with the Ludlum Model 3 (or equivalent) incorporating the gamma scintillation detector probe and determined in an area at least 200 feet away from the spill boundary for decontamination comparison.

6.10.2

Personnel and Clothing

Following are general guides for field use, harsher methods may be used under direction of a Health' Physicist or Physician.

- a. All contaminated clothing should be decontaminated by applying tape to the contaminated area in an attempt to transfer the material to the tape or by vacuuming. Contaminated clothing which cannot be decontaminated should be removed and placed in plastic bags for future laundering.
- b. A thorough washing with soap and water is the best general method of decontaminating the face, hands, hair and body. The water should be used only one time.
- c. A soft bristled brush or nail brush may be used; however, care should exercise not to irritate or abrade the skin. In addition, care must be taken to prevent decontamination solutions from entering the body openings or cuts.
- d. Several washings and rinsings may be necessary to achieve an acceptable decontamination level. To prevent chapping, lanolin or hand cream may be applied to areas which have been washed or scrubbed several times.
- e. In many cases, tenacious surface-absorbed contamination may be removed, from hands and/or forearms by promoting sweating in rubber gloves sealed at the cuff between washings.
- f. When contamination of a person is detected, nose swipes and urine samples should be collected (Section 6.8).

Ground Areas

The bulk spilled yellowcake will be shoveled into a lined metal drum and residual material will be vacuumed. Always clean the area ahead of you making certain to stand in a contamination free spot while working. Dusting during decontamination will be controlled by use of the water spraying unit (do not use excessive water). If the spill is contained under a plastic cover, remove the cover in one-foot increments as decontamination is accomplished.

The initial decontamination can be accomplished visually by color (yellow) observation, followed by survey with a Geiger counter and finally by alpha monitoring and monitoring with the TN Model 2590 equipment (or equivalent).

### Equipment

Field decontamination is limited in most instances to the removal of radioactive contamination that is loosely attached in grease, dirt or mud. Contamination that is impacted, ground-in or caught up in rust demands more abrasive measures and fairly sophisticated techniques often not available in the field. Basic field guidelines are:

- a. A plastic sheet or other “drop cloth” should be spread on the floor or ground to catch any loose contaminant prior to commencement of decontamination operations.
- b. Dry items may be vacuumed thoroughly incorporating scraping or wire brushing to loosen surface material.
- c. Items may be wet wiped using rags, or they may be sashed in or sprayed with water to remove loose contamination provided the items will not be damaged or impaired by moisture.
- d. Acetone dampened rags may be used to remove more tenacious surface-bound contamination.
- e. Failing the above, sandpaper or steel wool may be used to remove a thin layer of the surface material followed by vacuuming or damp wiping.
- f. Rags used for cleaning should be infolded and changed often to avoid spreading the contamination. (Used rags are placed in plastic bags.)
- g. If all above fails, and after thorough documentation of circumstances and contamination levels, the contaminant may be released from the accident site with prior government agency approval.

**ADDENDUM 1**

**PERSONNEL TRAINING PROGRAM  
FOR  
URANIUM CONCENTRATE SPILL EMERGENCY RESPONSE**

## INTRODUCTION

This Appendix outlines personnel training requirements to ensure emergency preparedness in the event of a transportation accident involving natural uranium (yellowcake). The training consists of classroom discussion and demonstration as well as practical field exercise.

## SESSION I - CLASSROOM DISCUSSION AND DEMONSTRATION

### A. General Information

Natural uranium (yellowcake) decays through a complex scheme that results in emanation of alpha, beta, and gamma radiation. The amount of radiation associated with a specific volume of yellowcake is very low when compared to other natural radioactive materials such as radium; therefore, small amounts of spilled yellowcake are relatively difficult to measure with portable instrumentation. In practical application, the beta/gamma radiation associated with small quantities of yellowcake can be detected more readily than alpha or gamma only; although alpha is more abundant, it does not travel a significant distance in air, and it is easily shielded making field measurements very time consuming and impractical for an emergency situation. Therefore, beta-gamma monitoring with a portable Geiger Mueller (GM) detector is the primary survey instrument used.

### B. Biological Hazards

The primary hazard associated with yellowcake is the effect of alpha radiation. Since alpha is a relatively large particle, it cannot penetrate the skin and must be inhaled or ingested to cause biological damage. Because of the low specific activity associated with yellowcake, it takes about 17 milligrams within the body to represent a maximum permissible body burden as compared to 0.0002 milligrams of radium-226 required to produce the same effect.

### C. Protective Clothing and Respirators

This equipment is provided to prevent contamination of personal clothing and the body as well as to avoid transfer of contamination to locations outside the spill area. The protective clothing and respirators are discussed in this section (demonstration and practice included).

#### 1. Coveralls

Coveralls are provided to prevent particulate contamination from coming in contact with the skin or clothing.

Coveralls are donned in the normal dressing manner directly over personal clothing. All openings (front, pockets, collar, and leg and sleeve cuffs) are sealed with tape before entering the spill area. When exiting the spill area, coveralls are removed as follows:

- a. All tape is removed;
- b. The front of the coveralls is pulled open, and;
- c. Coveralls are removed by pulling them off the shoulders and off the trunk and legs by turning legs inside out as the garment is removed. Used coveralls are placed in a plastic bag.

2. Shoe Covers

These are used to prevent liquid or particulate contamination from coming in direct contact with the wearer's shoes and to avoid tracking contamination outside the spill area. They are pulled on over the wearer's shoes and removed by grasping the top edge and pulling downward which results in turning the shoe cover inside out. Used shoe covers are placed inside a plastic bag.

3. Head Covers

These are used to prevent contamination from coming in direct contact with the hair, ears, head and neck. The head cover is placed directly on the head underneath other head wear (hard hats, if required). Head covers are removed by opening the front snaps, grasping the top, and pulling off toward the back of the head. Used head covers are placed in a plastic bag.

4. Gloves

Gloves are used to prevent contamination of hands from radioactive particulates and to protect the hands from corrosive materials. When exiting the contaminated (spill) area or after handling contaminated material, the glove is removed by grasping it by the cuff and pulling downward off the hand; this results in turning the glove inside out. Used gloves are then placed inside a plastic bag.

5. Respirators (Demonstration and Practice)

Respirators (full) are provided to prevent inhalation of particulate material which may become air-borne during spill containment or decontamination operations. Prior to use, the mask shall be checked as follows:

- a. Cleanliness of mask facepiece; valves, and eyepiece is visually checked.
- b. The head harness is checked to assure all straps and fasteners are functional.

- c. The canister is examined to assure free flow of air and tightness of connections.
- d. The integrity of the facepiece is visually checked by flexing the unit inside out and observing any cracks or holes.

Respirators are donned by placing the chin in first, then pulling the head harness or straps over the head, and tightening the straps.

To avoid contamination transfer when disrobing, protective clothing shall be removed in the following sequence:

1. Remove glasses;
2. Remove head cover;
3. Remove coveralls;
4. Remove respirator; and
5. Remove shoe covers.

Disrobing will take place at the “RADEX” area “control point”.

D. Radiation Monitoring and Sampling

Various portable radiation detection instruments are radiation sampling devices are provided to assist in identifying the boundaries of the spill area, determining radiation exposure rates, documenting contamination levels, and determining if internal personnel exposures have resulted. Since yellowcake has a very distinctive color, response team members should incorporate visual observation with radiation monitoring and sampling to assess contamination extent. This section discusses types of equipment provided and application of each (demonstration and practice included).

1. Beta-Gamma Monitoring

The Geiger Counters and Ludlum Model 3 with the Model 44-6 thin wall GM tube detector are used for beta monitoring (or equivalent). These instruments measure most of the beta and some (about ten percent) gamma radiation. This is the primary tool used for monitoring ground areas and equipment associated with a spill. Basic steps are as follows:

- a. Turn the instrument on and check the batteries.
- b. Turn the scale selector switch to the appropriate scale.

- c. Move the detector shield to the open window position.
- d. Place the U-238 check source on a flat, clean surface.
- e. Grasp the detector probe with fingers in a manner assuring not to cover the open window.
- f. Place the detector probe open window grill in contact with the check source.
- g. The meter should indicate cpm equal to about one-fifth (20 percent) of the total dpm of the source. (Since measurements are used for relative comparison with background radiation, and not for accurate exposure or analytical measurements, the object of this check is to ascertain instrument response to a radiation source.)
- h. Monitor desired area by moving the open window detector slowly (about one foot per second) over the area about one-inch above the surface.

2. Gamma Monitoring

The Ludlum Model 3 with the Model 44-2 gamma scintillation detector probe (or equivalent) is used for these measurements. Gamma measurements are not normally required in conjunction with a yellowcake spill; however, they can be used to supplement monitoring normally accomplished with a Geiger counter in the event Geiger counters are not available or operable. The instrument operational checks and subsequent monitoring are performed in the same manner as those discussed for beta, except the Cs-137 check source is used, and the detector probe does not have an open window (the lower one inch of the probe is the sensitive portion).

3. Alpha Monitoring

The Ludlum Model 3 with the Model 43-5 alpha scintillation probe (or equivalent) is used to make alpha measurements as follows:

- a. Turn the instrument on and push the “BAT” button to assure batteries are in good condition.
- b. Place the Th-230 check source on a flat, clean surface.
- c. Grasp the detector probe in the palm of the hand extending thumb and fingers about 0.5 cm below the detector window (to avoid damaging the mylar when monitoring rough surfaces).
- d. Turn the range selector switch to the appropriate position and center the

detector probe over the check source.

- e. The meter should indicate counts per minute (cpm) equal to about 20 percent of the total disintegrations per minute (dpm) of the source (the decimal equivalent of this percentage is called the “efficiency factor”).
- f. Counts per minute are converted to dpm through dividing them by the efficiency factor.
- g. Move the detector probe to surface requiring monitoring and hold in one place until meter reaches its maximum deflection.
- h. Since the detector probe covers about  $50 \text{ cm}^2$ , it is necessary to multiply measured dpm by 2 to obtain dpm/ $100 \text{ cm}^2$  for criteria comparison.
- i. Continue process in (g) above until entire surface is monitored.

4. Swipe Samples

Surface swipes are used to identify the presence of loose or removable contamination on the areas or items of interest for comparison with “acceptable surface contamination levels”. Swipes are spot checks for the presence or spread of contamination but they do not provide quantitative reproducible data which can be used to document contamination levels. Therefore, swipe samples and analysis results are treated more informally than direct instrument measurements obtained from the surface of concern.

The person collecting swipe samples must wear gloves. A surface area of approximately  $100 \text{ cm}^2$  is wiped with a dry Whatman filter paper to collect any larger contaminated particles. The filter paper is dampened with acetone to wipe surfaces for collection of very fine particles. Swipes are monitored with the alpha scintillation detector and resulting data is converted to dpm/ $100 \text{ cm}^2$ . After monitoring, the swipe is placed in an envelope (using tweezers to avoid scraping material off the swipe), the envelope is sealed with tape, and the sampling location and date of collection is recorded on the tape.

Nose swipes, consisting of “Q tips”, are collected from all persons working in or otherwise exposed to the yellowcake spill. Collection is accomplished by extending the cotton tip into each nostril and gently swirling it. These swipes are monitored and handled in the same manner as other surface swipes.

5. Air Sampling

High-volume air samplers are used to monitor presence of airborne radioactivity. One unit is located about 50 feet upwind from the yellowcake spill and another is located about 50 feet downwind from the spill as follows:

- a. Locate air sampler at least three feet above the ground in an area with no obstructions between the source (spill) and the sampler.
- b. Connect extension cords between samplers and the portable generator.
- c. Make certain filters are securely in place on the air sampler head.
- d. Turn the air sampler on and record the date, start time, sampler flow rate, and location.
- e. At the end of the sampling period (normally 24 hours), record the sampler flow rate, time of day and date, and secure the sampler.

Remove the sample filter and place in a plastic Petri-dish using care to assure particles are not removed from the filter.

- f. Mark the filter Petri-dish with pertinent data (d and e above) and commence another sampling period (c through g above).

E. Contamination Control

This section combines individual subjects covered in A, B, C, and D above in the practical manner they would be used in the field. Presentation will include questioning class members regarding actions for each subject as well as demonstration. Since the subjects in this section have previously been discussed in detail, a simple outline is used.

1. Radiation Exclusion (RADEX Area)

- a. Establish spill boundaries
  - 1) Visual
  - 2) Radiation monitoring
- b. Erect barricade
  - 1) Rope off
  - 2) Attach signs
    - a) May not be required if spill is minor and easily guarded
- c. Install air samplers

2. Control Point

- a. Equipment storage
- b. Personnel decontamination station
  - 1) Wash basins
  - 2) Soap, etc.
- c. Personnel debriefing

3. Check Station

- a. Access control
  - b. Radiation monitoring
    - 1) Personnel
      - a) Beta-gama, alpha
      - b) Nose swipes
      - c) Urine samples
    - 2) Equipment
      - a) Beta-gamma, alpha
      - b) Swipes
      - c. Protective clothing
        - 1) Disrobe at check station
          - a) Place in receptacles
4. Spill Containment
- a. Diking
    - 1) Soil
    - 2) Use of “dike-pak”
  - b. Trenching
    - 1) To avoid liquid passing into spill area
  - c. Covering
    - 1) Plastic sheet
    - 2) “Dike-pakTM
    - 3) Soil

F. Decontamination

This section presents a simple outline to be presented in a question and answer type of discussion.

- 1. Land Areas
  - a) Shoveling
  - b) Vacuuming
- 2. Personnel
  - a) Clothing
    - 1) Taping
    - 2) Vacuuming
    - 3) Removal
      - a) Sealed in plastic bag
      - b) Body
        - 1) Vacuuming
        - 2) Taping

- 3) Washing
- 4) Promoting sweating
- 5) Ear openings
  - a) Swabs
- 6) Eyes
  - a) Flush

3. Equipment

- a) Vacuuming
  - 1) Scraping
  - 2) Chipping
- b) Damp wipe
  - 1) Rags and acetone
  - 2) Water
- c) Washing
  - 1) Detergent scrubbing
- d) Sealing
  - 1) Only after reasonable decontamination efforts
    - a) Tape
    - b) Seal in plastic
    - c) Paint

## **SESSION II - FIELD EXERCISE**

This portion of the training program will be conducted outdoors on Company-owned property. An accident involving yellowcake spillage inside the van and on the surrounding ground area will be simulated using a readily visible material (corn meal, flour, lime, etc.). A few radioactive sources (probably uranium ore) will be scattered within the spilled material to accommodate practical radiation monitoring experience. The sequence of events following a yellowcake transportation accident will be enacted by the driver and response team members as outlined in this Section. A least one person will act as a local authority to ask questions and provide assistance when requested.

### **A. Driver Responsibilities**

1. Emergency Information
  - a. What is yellowcake and associated hazards.
2. Emergency Containment
  - b. Dike
  - c. Rope off
  - d. Cover (if appropriate)
    - a. Access control
3. Accident Notification
  - a. Accident report form
  - b. Notification by telephone

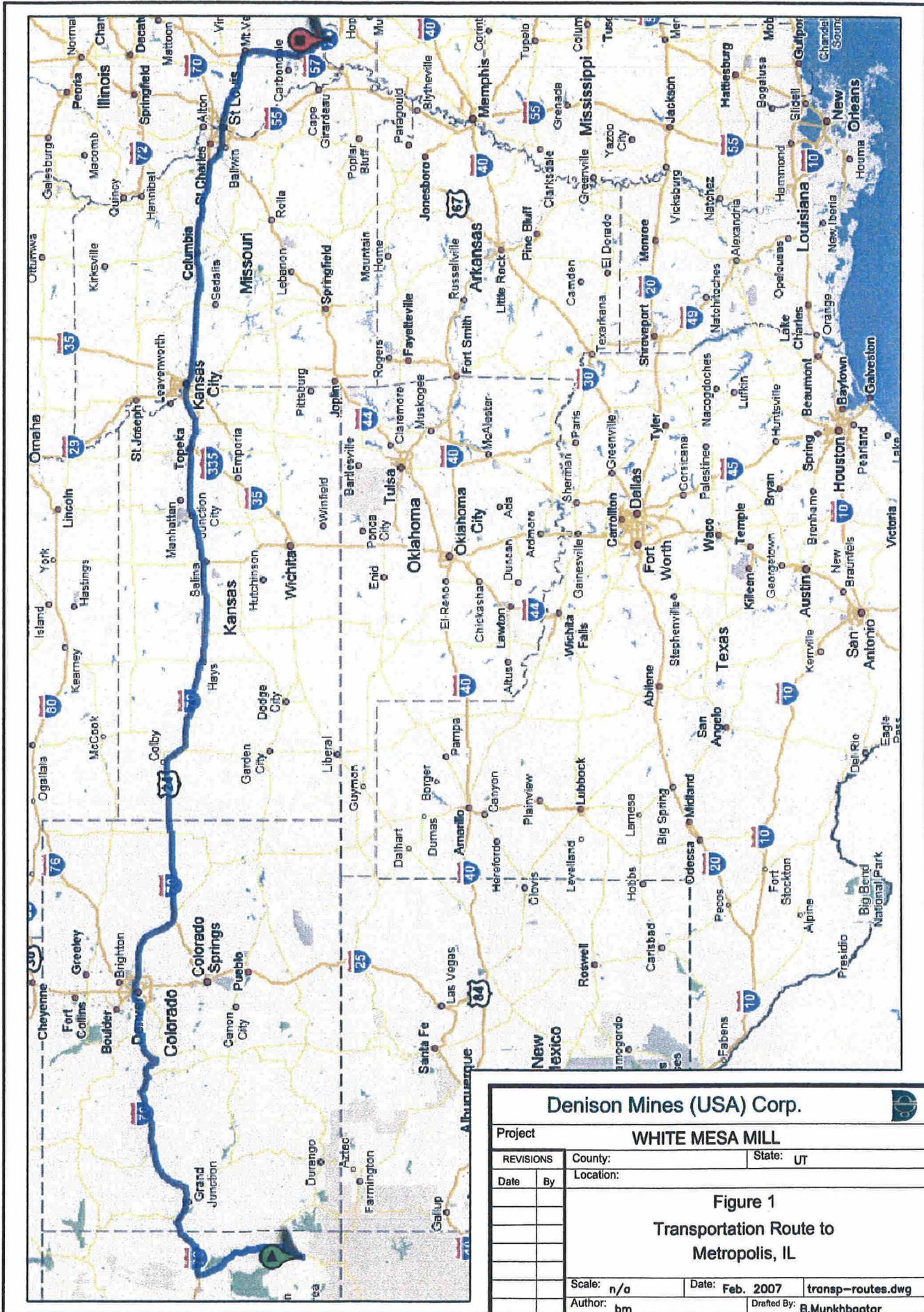
### **B. Response Team Responsibilities**

1. Mobilization
2. Press Release
3. Containment
  - a. Assessment (visual)
  - b. Rope barricade and signs
  - c. Cover (if appropriate) or dike
4. Contamination Control
  - a. Radiation survey of ground area (document)
  - b. Establish RADEX area
  - c. Establish control point
    - 1) Personnel decontamination
  - d. Establish check station
  - e. Start-up air samplers (document)
5. Decontamination (clean up entire spill)
  - a. Ground area
    - 1) Shovel

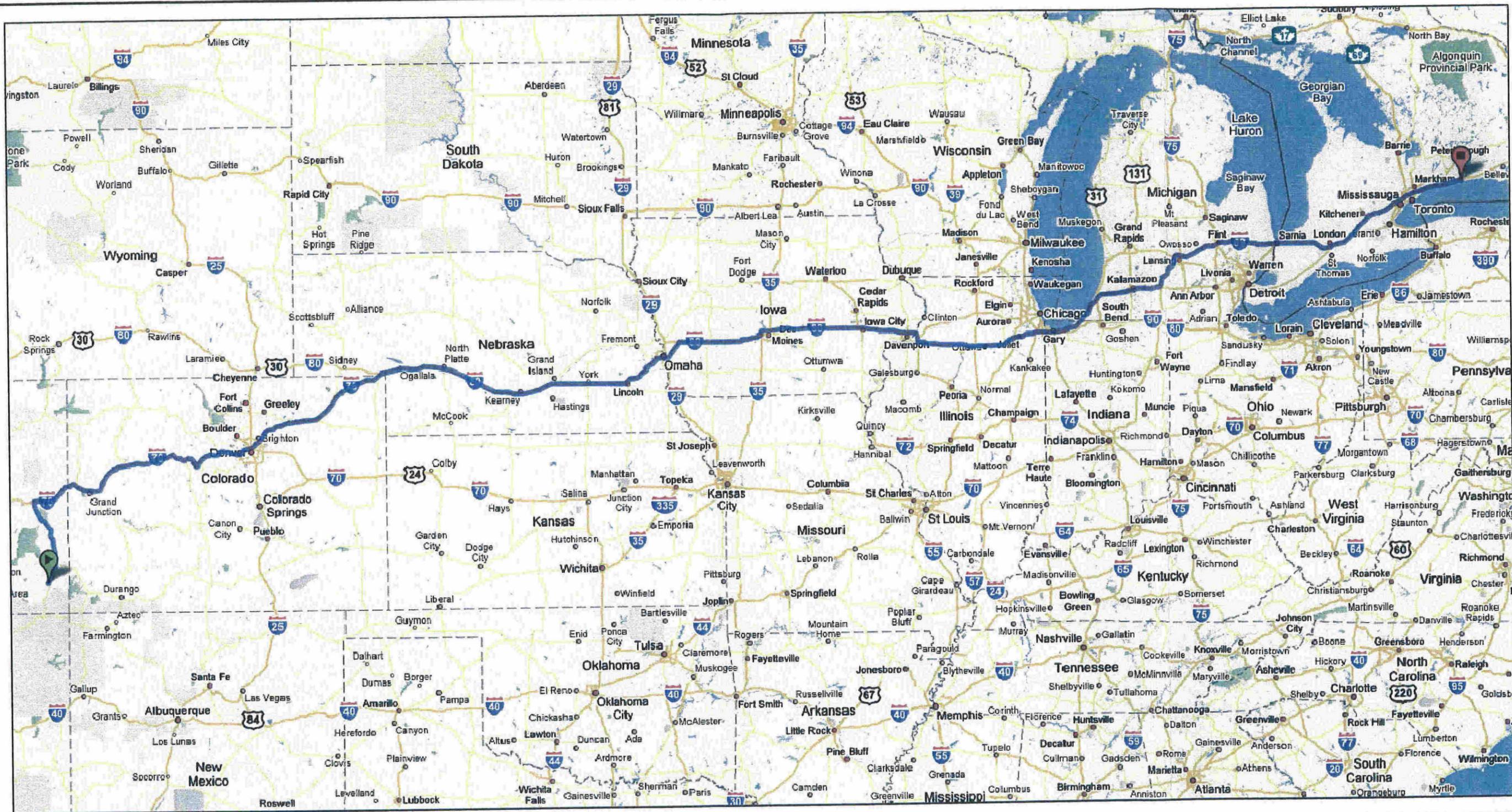
- 2) Vacuum
  - b. Personnel
    - 1) Clothing
    - 2) Body
    - 3) Nose swipes and urine sample (document)
  - c. Equipment
    - 1) Vacuum
      - a) Scrape
    - 2) Damp wipe
    - 3) Wash
    - 4) Scale
6. Equipment and Personnel Release
- a. Final radiation surveys
    - 1) Documentation
  - b. Final sampling
    - 1) Documentation
      - a) Personnel
      - b) Air
      - c) Swipes
  - c. Authorization
    - 1) Company representative
    - 2) Government agency
7. Documentation and Reports
- a. Accident Report Form
  - b. News release
  - c. Radiation surveys
  - d. Sampling data
  - e. D.O.T. Reports

**ADDENDUM 2**

**TRANSPORTATION ROUTES**



<b>Denison Mines (USA) Corp.</b>			
Project		<b>WHITE MESA MILL</b>	
REVISIONS	County:	State: UT	
Date	By	Location:	
		<b>Figure 1</b> <b>Transportation Route to</b> <b>Metropolis, IL</b>	
	Scale: n/a	Date: Feb. 2007	transp-routes.dwg
	Author: bm	Drafted By: B.Munkhbaatar	



<b>Denison Mines (USA) Corp.</b>			
Project		<b>WHITE MESA MILL</b>	
REVISIONS	County:	State: UT	
Date	By	Location:	
		<b>Figure 2</b> <b>Transportation Route to</b> <b>Port Hope, Ontario, Canada</b>	
Scale: N/A	Date: Feb. 2007	transp-routes.dwg	
Author: bm	Drafted By: B.Munkhbaatar		

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**ADDENDUM 3**

**DRIVER INSTRUCTIONS**

ADDENDUM 3

These instructions will be reviewed with the Company's drivers and become a part of their standing instructions. These instructions cover items that should be checked before and after shipment, as well as emergency procedures.

The representatives of the commercial carriers will be asked to fill out the accident questionnaire, notify us of the accident and state whether clean-up assistance is required.

## **Shipment of Uranium Concentrate Driver's Checklist**

### **1.0 Preshipment Activities**

- 1.1 Insure that the emergency procedures are included with the shipping papers.
- 1.2 Check to insure that the closure on the rear door of the truck is properly sealed.
- 1.3 Check package of emergency equipment to insure items shown in Section 8 are available.

### **2.0 During Transport**

- 2.1 Vehicle should be attended at all times while on the highway. It may be left unattended to obtain assistance during a breakdown.
- 2.2 The vehicle should not be parked on or within five feet of the public highway.
- 2.3 Check on parking and before start-up to insure rear door is properly sealed.

**Figure 4.2**  
**ACCIDENT REPORT**

1.0 Date \_\_\_\_\_ Time \_\_\_\_\_  
2.0 Person Calling \_\_\_\_\_ Capacity \_\_\_\_\_  
From Telephone No. \_\_\_\_\_ Who Else Notified \_\_\_\_\_  
3.0 Accident Location \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4.0 Description of the Accident  
Persons Injured \_\_\_\_\_ Name(s) \_\_\_\_\_  
Treatment \_\_\_\_\_  
Accident Description \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5.0 Was Any Company Material Spilled from the Vehicle(s)? \_\_\_\_\_  
\_\_\_\_\_

6.0 What Action Has Been Taken to Contain the Material? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7.0 Please report this information to one of the following:  
  
Monday - Friday 8:00 a.m. to 4:30 p.m. MST  
Harold R. Roberts, Executive Vice President – Operations, Denver, Colorado.  
Telephone No. 303-628-7798 day time, work days  
Night and weekend contact Telephone No. (303) 756-9050, Cell Phone (303) 902-2870  
  
Rich E. Bartlett, Mill Manager, White Mesa Mill, Blanding, Utah  
Telephone No. 435-678-2221 day time, work days  
Night and weekend contact Telephone No. (435) 678-2495

## **EMERGENCY INFORMATION AND PROCEDURES**

### **YOUR CARGO IS: Uranium Concentrate**

#### **THIS MATERIAL:**

1. Is NOT explosive.
2. Will not burn.
3. Is a naturally radioactive material of low specific activity. It should not be inhaled, eaten, or allowed to get into an open wound.
4. Can be approached without danger of injury from external radiation.

#### **IN THE EVENT OF ACCIDENT, AS SOON AS POSSIBLE:**

1. Take preliminary precautions below. Display these instructions as necessary to local authorities on the scene to obtain their help (see item 2 below).
2. Collect the information on the accident form attached.
3. Call (or have local authority call for you) the Executive Vice President - Operations, Denison Mines (USA) Corp., Telephone No. 303-628-7798, Denver, Colorado, collect, between 8:00 a.m. - 4:30 p.m. MST. At all other times call 301-816-5100.
4. If local authorities need radiological assistance have them call the DOE offices at 208-526-0111 Ext. 1515.
5. Make no other statements or phone calls except on instructions from Denison Mines (USA) Corp. Management.

### **PRELIMINARY PRECAUTIONS**

**CONTAINERS ARE NOT LEAKING, and are not seriously damaged. Container may or may not be thrown from vehicle. Vehicle may or may not be damaged.**

1. Caution people not to tamper with the containers. Use civil authorities to help you if necessary.
2. It is not necessary to have a specific distance between humans and the containers or truck, but for ease of controlling the situation, ask people to stay back 10 to 15 feet.

3. If closed containers are lying on the road, obtain assistance from whatever civil authority is available to move containers to the side of the road.
4. Assure local authorities that there is no danger in handling closed containers.

CONTAINERS ARE LEAKING OR DAMAGED TOO SERIOUSLY to be moved. Truck or railroad car may or may not be damaged.

1. Caution people to stay away from the material. Keep them at a distance of at least 25 feet. Extreme distance is not necessary. Use civil authorities to help if necessary.
2. Assure local authorities that there is no danger from radiation but that people should avoid breathing any dust from the material.
3. Avoid trackage of material by people or vehicle. Obtain help from local civil authorities if necessary to reroute traffic around the spill area.
4. Keep material from running into streets, gutters, sewers, etc., if possible. A simple method for doing this might be to dig a trench around the material or throw up an earthen dike several inches high.
5. If required, cover the spilled uranium concentrate. The vehicle's emergency kit contains four approved dust respirators, respirator user instructions, 1,000 square feet of plastic sheeting, tent stakes, nails, a hammer and a knife.

Don a respirator and cover the spilled material with the plastic sheeting and secure the edges of the plastic to the ground using tent stakes or to the bed of the truck with nails. Undamaged containers can be moved to the side of the road.

6. Avoid breathing dust from the material. When covering the material, obtain a simple respirator if possible. If none is available, work the material in such a manner as not to stir up excessive dust.

FIRE involving vehicle or in immediate vicinity of vehicle.

1. Isolate the vehicle from other people and property if possible. Use civil authorities for help.
2. Obtain fire fighting help from local group.
3. The material you are hauling will not burn.

4. Keep fire away from uranium containers if possible.
5. Use respirator if necessary to avoid breathing smoke from any fire involving your cargo because of the possibility of airborne particles, if the drums are ruptured.
6. Do not spray water into open or leaking containers. There is no reaction with water but a heavy stream of water will spread the material and make cleanup more difficult

**EXHIBIT 1**

**EMERGENCY NOTIFICATION LIST**

**ATTEND TO ANY INJURED PERSONS AND NOTIFY THE SUPERVISOR:**

- Give artificial respiration if necessary.
- Control bleeding;
- Treat for shock;
- Immobilize fractures and stabilize for transportation;
- Scan the injured person for excessive alpha prior to transporting if time allows
  - (If alpha is excessive or there is no time to scan, notify the clinic/hospital personnel and the Radiation Safety Office); and
- Perform other first aid as more specifically described in Section 2.1 or Appendices A through I for the specific types of accidents and resulting injuries

**THE INCIDENT COMMANDER OR HIS DESIGNEE WILL NOTIFY THE FOLLOWING AS NEEDED:**

Blanding Clinic.....678-2254 or 678-3434 (930 N. 400 W.)  
San Juan Hospital, Monticello.....678-2830 or 587-2116 (364 W. 1st N.)

**EMT TRAINED** – The following personnel should be contacted, if they are on-site, in the event of an emergency to aid in the event of any injuries to personnel.

David Turk

**AMBULANCE SERVICE**

Blanding.....Dial 911

If the Company Ambulance is used, an attendant must ride with the injured in addition to the driver, except where the injured could normally be transported in a car or pickup.

**OTHER EMERGENCY NUMBERS**

Fire Department.....Dial 911 or 678-2313  
County Sheriff .....Dial 911 or 587-2237  
Highway Patrol .....Dial 911 or 587-2000  
Blanding Police.....Dial 911, 678-2916 or 678-2334

**MANAGERS**

The Supervisor will notify one of the following of all incidents:

R.E. Bartlett .....435-678-2495  
D. Turk.....435-678-7802 or 435-459-9786  
R. Wallace.....435-459-1093

**A MEMBER OF MANAGEMENT WILL NOTIFY THE PROPER REGULATING AGENCIES AS REQUIRED FOR EACH INCIDENT (SEE SECTION 2.1 AND APPENDICES A THROUGH I):**

- State of Utah, Division of Radiation Control .....801-536-4250 (business hours)
  - After hours call UDEQ Duty Officer at ..... 801-536-4123 (after hours)
- State of Utah, Division of Water Quality, Groundwater Protection Section.....801-538-6146 (business hours)
  - After hours call UDEQ 24-hour number at.....801-538-6333 (after hours)
- MSHA Field Off.--801-524-3450 Dist. Off. .... 303-231-5465
- MSHA, Arlington .....800-746-1553
- State Emergency Response Comm. .... 801-538-3400
- State of Utah, Natural Resources, Dam Safety .....801-538-7200
- National Response Center ..... 800-424-8802
- Utah Poison Control Center.....800-456-7707

Notification of surrounding communities and or residences will be handled by the appropriate agencies as required by EPCRA (Emergency Planning and Community Right to Know Act). See Section 2.1 and Appendices A through I.

**EXHIBIT 2**

**INTERNAL NOTIFICATIONS**

Internal reporting requirements for Incidents, Spills and Significant Events are as follows: (see Section 2.1 of the Plan and Appendices A through I for more specific internal notification requirements that may apply to each type of emergency situation):

**Report Immediately:**

Event Criteria:

- Release of toxic or hazardous substances.
- Fire, explosions or other accidents.
- Government investigations information, requests or enforcement actions.
- Private actions or claims (corporations or employees).
- Deviations from Corporate policies or government requirements by Management.

Other significant events, which have resulted or could result in:

- Death, serious injury or adverse health effect (employees or public).
- Property damage exceeding \$1,000,000.
- Government investigation or enforcement action – limiting operation or penalties of \$100,000 or more.
- Significant criminal actions.
- Substantial media coverage.
- Unscheduled down time of more than 24 hours.

**Report at the Beginning of the Next Business Day:**

Incident Criteria:

- Was reported to a government agency as required by law.
- Worker (DUSA or contractor) recordable injury or illness associated with a release.
- Community impact - reported or awareness.
- Publicity resulted or is anticipated.
- Release of 5,000 pounds or more of process material, waste or product.

The local manager in charge is to call Harold Roberts, Ron Hochstein or David Frydenlund.

Harold Roberts (Executive Vice President).....303-389-4160 (office)  
303-756-9050 (home)  
303-902-2870 (cell)

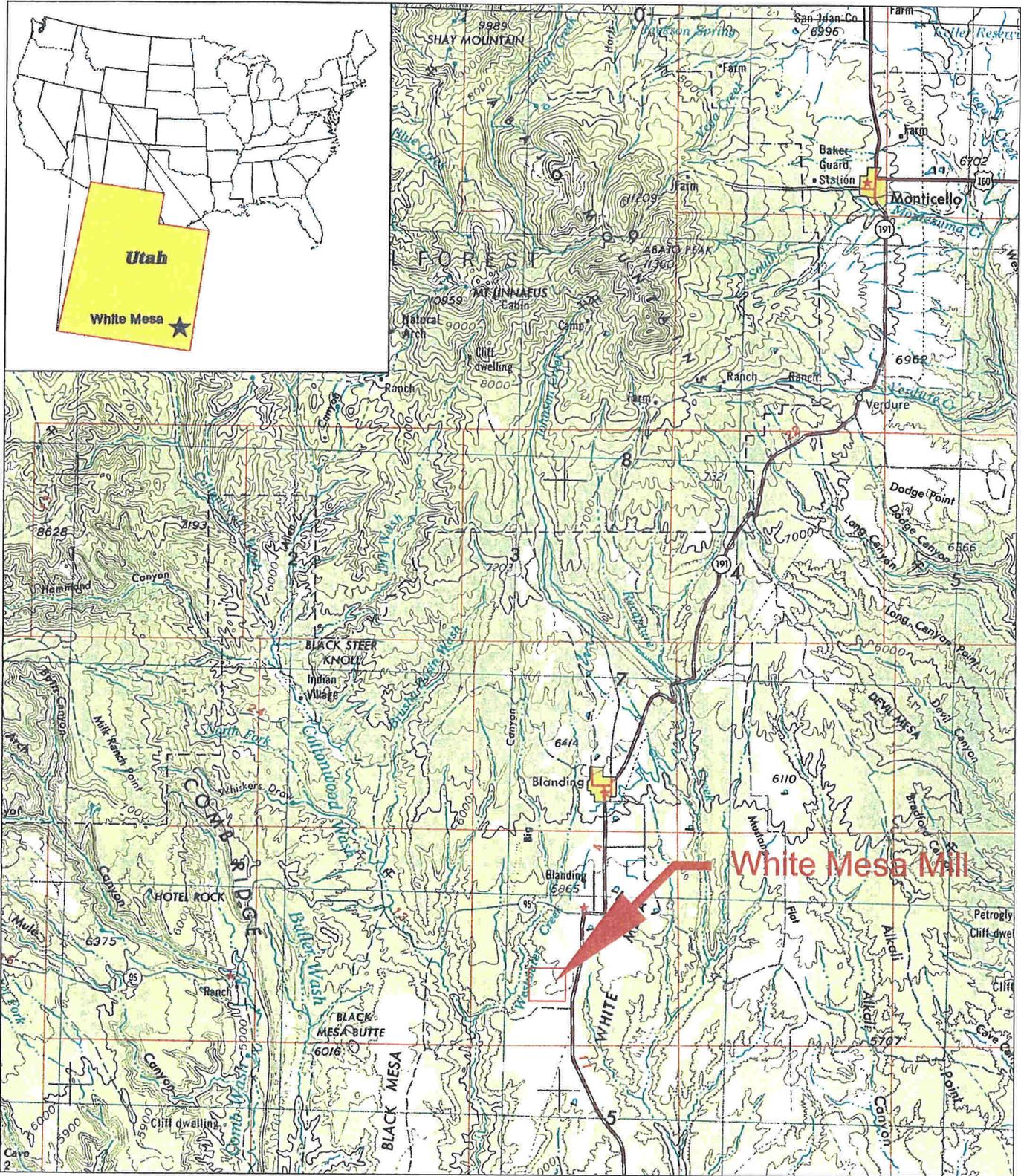
Ron Hochstein (President).....604-689-7842 (office)  
604-931-6334 (home)  
604-377-1167 (cell)

David Frydenlund (Vice President) .....303-628-7798 (office)  
303-221-0098 (home)  
303-808-6648 (cell)

**EXHIBIT 3**  
**SITE LAYOUT MAP**



**EXHIBIT 4**  
**GENERAL AREA MAP**



<b>International Uranium (USA) Corporation</b>			
Project		<b>WHITE MESA MILL</b>	
REVISIONS	County:	State: UT	
Date	By	Location:	
		<b>Figure 3.2 - 1</b> <b>White Mesa Mill</b> <b>Location Map</b>	
Scale: 1:250,000		Date: March 2003	figure 3.2-1.dwg
Author: HRR		Drafted By:	

**EXHIBIT 5**  
**DRAINAGE MAP**



- 1 USGS GAUGE NO. 09376900
- 2 USGS GAUGE NO. 09378630
- 3 USGS GAUGE NO. 09378700

International Uranium (USA) Corporation			
Project		WHITE MESA MILL	
REVISIONS		County:	State: UT
Date	By	Location:	
<p>Figure 3.7 - 1</p> <p>Drainage Map of the Vicinity</p> <p>of the White Mesa Mill</p>			
Scale: 1:250,000		Date: March 2003	figure 3.7-1.dwg
Author: HRR		Drafted By:	

**EXHIBIT 6**  
**POPULATION CENTERS MAP**



## **EXHIBIT 7**

### **MAIN SHUT-OFF VALVES**

During an emergency this list should be used along with Site Layout Map (Exhibit 3) to locate tanks and valves associated with these tanks.

### **REAGENT SHUT-OFF VALVE LOCATIONS**

#### **Sulfuric Acid**

4" Main located south side of acid tank

East acid pump discharge valve

West acid pump discharge valve

3" Main (leach area) located 25 feet west of Derrick screens next to walkway

1-1/2" Main (SX area) located south of Central Control room

#### **Ammonia**

4" Main (east tank) located on end at bottom

4" Main (west tank) located on end at bottom

2" Valve located on top of tank (east tank)

2" Valve located on top of tank (west tank)

#### **Kerosene**

2" Main valve located at bottom of tank (east tank)

2" Main valve located at bottom of tank (north tank)

2" Main valve located at bottom of tank (south tank)

Pump discharge 2" valve

#### **Soda Ash**

Main valve located at bottom of tank (dry storage)

4" Main valve located at bottom of tank on 30% dilution tank

4" Main valve locate at bottom of tank on dilution tank

**Salt**

3" Main valve located at bottom of tank

**Caustic Soda**

3" Main valve located at bottom of tank east and west between supports

**Sodium Chlorate**

- 3" Main valve located at bottom of tank (east tank)
- 3" Main valve located at bottom of tank (north tank)
- 3" Main valve located at bottom of tank (south tank)

**Propane**

- 4" Main located 15 feet east of tank
- 3" Main located on pipe off top of tank
- 3" Main located at bottom of tank (also fill pipe)

**PLANT UTILITY SHUT-OFF VALVE LOCATIONS****Process Water**

- Main valve located on west side of water storage tank
- Discharge valve off service water pump east
- Discharge valve off service water pump west
- Mill process water main located east wall by SAG mill

**Fire Water**

- Main valve located west side of water storage tank
- Emergency fire pump discharge valve to fire system
- Emergency fire pump discharge valve to header west side of pump house
- 8" Main valve located south of Central Control room for SX and boilers

**Potable Water**

- 2" Main (suction) from potable water storage tank
- 2" Main (discharge) from potable water storage tank
- 4" Main located at east wall by SAG mill
- 4" Main located south of Central Control room for SX, Maintenance shop, and offices

**Steam**

Main discharge valve for Superior boiler located at top of boiler

Main steam valve located south side of boiler house

**Plant Air**

Main valve located at receiver tank in compressor room at boiler house

Main valve to mill building located south of Central Control room

**PROCESS SHUT-OFF VALVE LOCATIONS****Pulp Storage**

No. 1 valve located on west side of tank

No. 3 valve located on west side of tank

No. 2 pulp storage valve located on west side of tank

**Pre-leach Thickener**

Main valve located underneath at center cone

**Clarifier**

Main valve located underneath at center cone

Main valve located underneath at center cone

**CCD Thickeners**

Main valve located underneath at center cone of each thickener

**FIGURE 1**

**FIRE SYSTEM SCHEMATIC DRAWING**

